Michael D. Gaffney, ISB No.3558
Lance J. Schuster, ISB No. 5404
BEARD ST. CLAIR GAFFNEY P.A.
2105 Coronado Street
Idaho Falls, Idaho 83404-7495
Telephone: (208) 523-5171
Facsimile: (208) 529-9732

Attorneys for Plaintiff

FILED
U.S. DISTRICT COURT
DISTRICT OF WYOMING

JUL 24 2007

Stephan Harris, Clerk
Cheyenne

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF WYOMING

ENVIRONMENTAL PRESERVATION FOUNDATION, HABITAT FOR WILDLIFE, Plaintiffs, vs. BUREAU OF LAND MANAGEMENT, ROBERT BENNETT, WYOMING DIRECTOR, in his official capacity, CHUCK OTTO, PINEDALE RESOURCE AREA FIELD MANAGER, in his official capacity, Defendants.	Case No.: CV-07CV 165 J COMPLAINT

Plaintiffs complain of Defendants, and for cause of action allege as follows:

Parties, Jurisdiction, Venue

1. Plaintiffs Environment Preservation Foundation ("EPF") and Habitat for Wildlife ("HFW") are non-profit environment and wildlife advocacy groups, duly organized under the laws of the State of Utah, with their principal places business at Salt

ORIGINAL

Lake City, Utah. EPF has members throughout the Western United States including members resident in Wyoming and elsewhere who regularly use the public lands the subject hereof, the Pinedale Anticline, for hunting, recreation, and aesthetic purposes. HFW has members throughout the West, who regularly use subject lands for hunting and recreation.

2. Plaintiffs Tim Teichart and Matthew Teichart are individuals, residents of Cokeville Wyoming, and members of HFW who regularly use the Pinedale Anticline for hunting, recreation and aesthetic purposes.

3. Plaintiffs Jay Johnson and Scott Oldroyd are individuals, residents of Kimmerer, Wyoming and members of EPF who regularly use the Pinedale Anticline for hunting, recreation and aesthetic purposes.

4. Plaintiffs' interests are not inimical to development of mineral resources within the Pinedale Anticline as permitted by law. Plaintiffs seek enforcement of requisite protections for wildlife, which are threatened by Defendants' failure to perform their obligations under applicable law.

5. The Pinedale Anticline consists of public lands of the United States situated principally in Sublette and Lincoln Counties, Wyoming.

6. Defendant, Robert Bennett, is the Wyoming State Director of the BLM. As such, Defendant exercises supervisory authority over all land and resource management decisions affecting public lands in Wyoming under the administration of the BLM, including the lands at issue here. Defendant, Robert Bennett, is sued solely in his official capacity.

7. Defendant, Chuck Otto, is the Pinedale Resource Area Field Manager. Defendant, Chuck Otto, exercises supervisory authority over all land and resource management decisions affecting public lands in Wyoming under the administration of the Pinedale Anticline Project Area ("PAPA"), and is directly responsible for authorizing the BLM's actions challenged herein. Defendant, Chuck Otto, is sued solely in his official capacity.

8. Defendant BUREAU OF LAND MANAGEMENT is an agency or instrumentality of the United States, within the U.S. Department of Interior, and is the federal agency charged by law with administrating the public lands within the Pinedale Resource Area at issue here.

9. The causes of action alleged herein arise under the Federal Land Policy and Management Act, 43 U.S.C. § 1701, et seq, ("FLPMA"), the Administrative Procedure Act, 5 U.S.C. § 701, et seq, ("APA"), the Declaratory Judgment Act, 28 U.S.C § 2201 et seq., the National Environmental Policy Act, 42 U.S.C. § 4321, et seq, ("NEPA")., the Endangered Species Act, 16 U.S.C. § 1531, et seq., ("ESA"), and Migratory Bird Treaty Act, 16 U.S.C. § 703.

10. The Court has jurisdiction of this matter pursuant to 28 U.S.C. § 1331.

11. Venue is proper in the District of Wyoming, pursuant to 16 U.S.C. § 1540 (g)(3)(a) and 28 U.S.C. § 1391.

12. Defendants' failure and refusal to fulfill duties enjoined upon them by law constitute "final agency action" for purposes of 5 U.S.C. § 702.

13. Defendants' ongoing violations of law in their management of these public lands under the ESA, NEPA, FLPMA, the Migratory Bird Treaty Act, and the APA

adversely and irreparably injure the aesthetic, economic, commercial, scientific, conservational, recreational, educational and wildlife preservation and other interests of Plaintiffs. These are actual concrete injuries caused by defendants' violations of law. The declaratory and injunctive relief sought herein would redress these injuries.

General Allegations

14. The Pinedale Resource Area (PRA), in relation to the Rock Springs District of the BLM and to the State of Wyoming, is shown on Exhibit "A." The PRA consists of a biologically diverse area that includes ungulate and migratory bird populations and supporting vegetation. The PRA is also a popular recreation area.

15. The PRA also encompasses the Pinedale Anticline Project Area the (PAPA). The PAPA is a broad area of potential oil and gas development, including the previously developed Jonah I and Jonah II oil and gas fields, and the contemplated Atlantic Rim Field. The PAPA is located in the upper Green River Basin of Western Wyoming, approximately 5 km southwest of Pinedale. The PAPA consists primarily of federal lands (80%) and minerals administered by the BLM. The State of Wyoming owns 5% (39 km2) of the surface and another 15% (121 km) is private. The area contains abundant deep gas reserves, and supports a substantial local oil and gas industry.

16. Beginning in 2000, the Bureau of Land Management (BLM) approved the construction of 700 producing well pads, 645 km of pipeline, and 444 km of roads to develop a natural gas field in the PAPA.

17. The PAPA contains one of the largest and highest density (19 to 30 deer/km^2) mule deer winter ranges in Wyoming. It also supports a variety of agricultural and

recreational uses, and provides winter range for 4,000 to 5,000 migratory mule deer that summer in portions of 4 different mountain ranges 80 to 200 km away.

18. Although the PAPA covers 799 km, most mule deer winter in the northern one-third, an area locally known as the Mesa. The Mesa is 260 square km in size, bounded by the Green River Basin on the west and the New Fork River on the north, south, and east, and vegetated primarily by Wyoming big sagebrush (*Artemisia tridentata*) and sage-brush-grassland communities. Elevation ranges from 2,070 to 2,400 m.

19. The PAPA is also the historical habitat for a viable population of sage grouse. Sagebrush and sagebrush habitats such as contained within the PAPA are essential for sage grouse survival. Suitable habitat consists of plant communities dominated by sagebrush and a diverse native grass and forb (flowering herbaceous plants) understory. The composition of shrubs, grass and forbs varies with the subspecies of sagebrush, the condition of the habitat at any given location, and range site potential. Seasonal habitats must occur in a patchwork or mosaic across the landscape. Their spatial arrangement, the amount of each seasonal habitat, and the vegetative condition determine the landscape's potential for sage grouse. This arrangement is an important factor in determining if a population is migratory or non-migratory in nature. Both quantity and quality of the sagebrush environment determines suitability for and productivity of sage grouse.

PAPA Management

20. The BLM is required to manage PAPA according to the provisions provided in FLPMA. FLPMA requires that the BLM develop a land use plan that must contain a number of criteria, including "observing the principles of multiple use and sustainable

yield" (Section 202.1), giving priority to the designation and protection of areas of critical environmental concern (202.3), "considering the relative scarcity of the values involved and the availability of alternative means and sites for realization of those values" (202.6), "weighing the long-term benefits to the public against short-term benefits (202.7), and incorporate the plans and data from other governmental entities with jurisdiction over the area, including other federal agencies, states, local governments and tribes, as well as provide "meaningful public involvement" with these governmental entities and members of the interested public in the management of the area (202.9).

21. FLPMA also requires that the BLM follow its land use plan (section 302).

22. FLPMA also requires that the BLM establish "advisory councils" to provide continual oversight and input to ensure that the BLM adequately manages the resources under the law and its land use plan (section 309).

23. As required by FLPMA, the BLM developed a land use plan for PAPA under terms and conditions stated in the Record of Decision ("ROD") for the Final Environmental Impact Statement for the Pinedale Anticline Oil and Gas Exploration and Development Project Sublette County, Wyoming ("PAPA ROD"), and the Resource Management Plan ("RMP") approved thereby in 1999.

24. The RMP provides the management direction for approximately 931,000 acres of public surface and 1,185,000 acres of federal mineral estate (approximately 919,000 of these acres are both federal surface and federal mineral estate) administered by the Bureau of Land Management within the Pinedale Resource Area.

25. The objective of the RMP regarding mineral development, including oil and gas development is as follows: "The public lands and federal mineral estate will be made

available for orderly and efficient development for mineral resources. All minerals actions will comply with goals, objectives, and resource restrictions (mitigations) required to protect the other resource values in the planning area. Generally, the planning area will be open to consideration for exploration, leasing, development for all leaseable minerals, which include oil, gas, coal, oil shale, and geothermal steam, in accord with applicable provisions (e.g., restrictions, prohibitions). All activities will be conducted in accordance with the guidance for mitigation of surface-disturbing activities.

26. The objective of the RMP respecting production of wildlife and wildlife habitats is:

(a). To the extent practicable, wildlife habitat management will be oriented toward the maintenance of fish and wildlife habitats to support populations at 1987 Wyoming Game and Fish Department planning objective levels. Activity planning will emphasize habitat enforcement and protection. Changes within Wyoming Game and Fish Department planning objective levels will be considered, based on habitat capability and availability.

(b). Wildlife habitat activity planning will include other species as well as federally listed threatened and endangered species. Threatened and endangered (T&E) species and their habitats will be protected. Actions which would degrade habitat to the point of jeopardizing the continued existence to a T&E species will not be allowed. The U.S. Fish and Wildlife Service (USFWS) will be consulted on any action with reasonable potential to affect endangered species and their habitats.

(c). Mule deer, elk, antelope, and sage grouse use patterns will be monitored. Habitat trends for the species will be interpreted through survey data

collected, in cooperation with livestock and watershed studies and monitoring activities. Interdisciplinary selection of key areas and plant species will ensure that crucial habitats are monitored.

27. High priority will be given to improvement of wildlife through vegetative manipulation. In particular, the RMP provides that Vegetative Manipulation Opportunities will be taken advantage of and Habitat Guidelines for Brush Control will be observed in order to preserve to the extent practicable the wildlife habitat available at initiation of the RMP.

28. To the foregoing ends, surface disturbance restrictions are imposed by the RMP on oil and gas, and other, development. The surface disturbance restrictions are necessary to protect certain sensitive resources and areas from adverse affects of surface-disturbing activities and human presence, and are inclusive of the various management actions developed in and analyzed for the approved RMP. These restrictions apply to all types of activities involving surface disturbance or human presence impacts and are applied in accordance with the guidelines described in the Wyoming BLM Standard Mitigation Guidelines for Surface-Disturbing Activities. The guidelines include, where applicable, proposals for waiver, exception, or modification, based on analysis for individual actions. This would allow for situations where a surface-disturbing activity may actually benefit sensitive resources, and allow those occasions when analysis determines that an activity will not affect those resources.

29. Throughout, implementation of the management actions and decisions in the RMP will be tracked and evaluated to determine their effectiveness and determine if the objectives of the RMP are being met. If evaluation indicates that the RMP is not working

as expected or needed, or if situations in the resource area change, it may become necessary to modify or amend, the approved RMP. All mitigation measures identified directly or referenced or implied in the approved Pinedale RMP are adopted. Additional or revised mitigation identified through activity planning or individual analysis, and that are in conformance with plan objectives, will be considered a supporting part of the approved RMP. At the same time, amendments for actions where analysis determines that the objectives established in the plan are the desired objectives, the plan would not be amended and nonconforming actions would not be allowed.

30. Among "other applicable law" binding upon Defendants without modification in the maintenance of said Resource Management Plan are "any provision of Federal law relating to migratory birds or to endangered or threatened species". 43 U.S.C. § 1732.

31. As part of their obligation to maintain such Resource Management Plan "with public involvement", Defendants were required, promptly upon approval of such plan, to establish an "Advisory Council" of public and private persons and entities to advise Defendants regarding the maintenance of such plan, and to provide public and private entities and persons notice and adequate opportunity to be heard regarding "execution" of such Plan. 43 U.S.C. § 1739 (a), (e).

32. Implementation of such Resource Management Plans must "to the maximum extent, be consistent with officially approved and adopted resource related policies and programs of other Federal agencies" and others. 43 C.F.R. § 1610. 3-2 (b).

33. Among Defendant's obligations to enforce "sustained yield" is the obligation to avoid and prevent "unnecessary or undue degradation" of public resources, by

appropriate regulation and the requirement and enforcement of effective mitigation measures. 30 U.S.C. § 22; 43 U.S.C. §§ 1732 (b), 1733 (a).

34. With respect to effective mitigation, Defendants must first encourage avoidance of impact altogether by not taking an action; second, minimize the impact by (a) limiting the degree or magnitude of the action and its implementation, (b) rectifying or eliminating the impact by repairing, rehabilitating, or restoring the affected environment, and (c) reducing or eliminating the impact over time by taking appropriate steps during the life of the action; and; third, if impacts are unavoidable, require the operator to compensate for the impact by replacing or providing substitute resources or environments. Defendants are bound to recognize that any impact which can be mitigated, but is not, constitutes prohibited undue or unnecessary degradation.

35. In furtherance of their obligations as hereinabove set out, Defendants may "conduct investigations, studies, and experiments - - involving the management [and] protection - - -of public lands." 43 U.S.C. § 1737 (a).

Failure to properly manage PAPA for wildlife

36. Defendants have instituted and maintained procedures whereby, without public notice, review, or comment, operators apply to Defendants for, and are regularly granted by Defendants, exceptions to restrictions and prohibitions contained in the Resource Management Plan. The result has been regular failure to enforce plain or apparent restrictions contained in the Resource Management Plan, without notice to the public or opportunity to object.

37. Numerous public reports and papers responding to the effects of PAPA management practices have indicated decimation of local wildlife populations that

Defendants have instituted no effective monitoring practices and have required no effective mitigation measures. These reports include but are not limited to the following reports some of which are attached as exhibits to this petition:

The annual "Sublette Mule Deer Study " (Western Ecosystem Technology, Inc.,), attached as "Exhibit B"

Wyoming Greater Sage-Grouse Conservation Plan (State of Wyoming), attached as "Exhibit C"

"Greater Sage-grouse Population Response to Natural Gas Field Development in Western Wyoming" (Ph.D. Dissertation, Univ. of Wyoming, Holloran, M.J 2005), and "Wildlife & Energy Development-Pronghorn of the Upper Green River Basin" (Berger & Busman, 2006), attached as "Exhibit D."

The impact of increased oil and gas leasing activities on wildlife such as mule deer in the PAPA was also raised by the U.S. Secretary of Interior, Dirk Kempthorne, in a press journal attached as "Exhibit E."

38. In addition to the above mentioned studies and reports, contrary to FLPMA's requirements of "meaningful public involvement" by other federal, state and local entities, the Defendants have failed to take into consideration and act upon data and concerns raised by other governmental entities with jurisdiction over wildlife and environmental resources. These agencies have suggested that the escalation of oil and gas exploration has dramatically impacted wildlife and the environment. For instance, the State of Wyoming Game and Fish Department has reported alarming trends in the loss of mule deer and sage grouse in the PAPA region as a result of oil and gas activities. The U.S. Fish and Wildlife Agency has reported concerns about the loss of critical sage

grouse habitat. Nevertheless, Defendants have refused to alter oil and gas operations or adequately mitigate loss of wildlife. For example, Defendants failed to consider the several recommendations found in the Wyoming Game and Fish Department's "Guidelines to manage sage grouse populations and their habitats" and the "Wyoming Greater Sage-Grouse Conservation Plan."

39. Further, Defendants have not consulted with the State of Wyoming's Department of Environmental Quality or the U.S. Environmental Protection Agency in regard to the cumulative effects of the oil and gas activities on both air and water. Defendants have only assessed air quality impacts of the wells and fields on an individualized basis, and not cumulatively. It is very likely that the cumulative output of air pollution from the oil and gas activities far exceeds the state and federal air quality standards. In regard to water quality, Defendants have not consulted with the State of Wyoming's Division of Water Quality for appropriate methods of injection wells and underground injection controls. Further, Defendants have failed to provide or prepare a comprehensive survey of surface and underground water resources that exists in the PAPA.

40. In regard to FLPMA and RMP requirements for general public involvement, Defendants did not appoint an Advisory Committee for the Pinedale Anticline Working Group (PAWG) until 4 years after approval of the plan. Defendants then rejected critical advice provided by the Committee. As a result, many of the members of the committee have resigned.

41. Similar practices implemented in the Jonah I and Jonah II fields resulted in depopulation of the areas of deer and sage grouse, requiring provision of substitute

habitat. The latter measure has failed because the populations no longer exist. The Fish and Wildlife Service has warned BLM that similar practices in the PAPA are in failure, and must not be implemented in the contemplated Atlantic Rim Field. Defendants have routinely failed to respond to requests under the Freedom of Information Act for documentation of any monitoring or mitigation measures implemented in the PAPA. Thc Fish & Wildlife Service, however, which monitors effects of Defendants' actions in adjoining areas, has recently ordered cessation of approval and maintenance in adjoining areas of produced water ponds such as routinely approved throughout the PAPA.

National Environmental Policy Act (NEPA)

42. EPF and HFW also has an interest in availing itself, its members and other members of the public the opportunities NEPA affords for public participation in connection with the preparation of documents that seek to analyze the environmental consequences of government actions. These interests have been adversely affected by Defendant's failure to prepare, circulate and consider either an adequate EIS.

43. Section 101(b) of NEPA, 42 U.S.C. sec. 4331 provides that the federal government use all practicable means to carry out key purposes, including:

a. "attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;

b. preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, and environment which supports diversity , and variety of individual choice; and

c. achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities"

To carry out these purposes, section 102(2)(A) of NEPA requires that federal agencies "utilize a systematic, interdisciplinary approach which will ensure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on man's environment."

44. Section 102(2)(C) of NEPA, further requires all federal agencies, including Defendants to:

> "Include in every recommendation or report on . . . major Federal actions significant affecting the quality of the human environment, a detailed statement by the responsible official on
>
> (i) the environmental impact of the proposed action.
>
> (ii) Any adverse environmental effects which cannot be avoided should the proposal be implemented.
>
> (iii) Alternatives to the proposed action.
>
> (iv) The relationship between local short-term uses of man's environment and the maintenance and enhancement of long term productivity, and
>
> (v) Any irreversible and irretrievable commitments of resource which would be involved in the proposed action should it be implemented."

This detailed statement, which is required under NEPA before a major federal action significantly affecting the environment may be undertaken, is called an Environmental Impact Statement ("EIS.")

45. An EIS was prepared by Defendants for the PAPA and released in 2000, and is referred to as the "Final Environmental Impact Statement for the Pinedale Anticline Project Area." This EIS contemplated as many as 900 initial well pads, 700 producing wells, 700 production facilities, central production facilities, 4 compressor facility sites, water wells for drilled, an Amoco Field Office, 121 miles of sales pipelines, 278 miles of gathering pipeline systems and 276 miles of access roads. To mitigate and accommodate

for wildlife, the 2000 EIS and ROD allows wells to be functional during limited times of the year and under limited conditions --unless "exceptions" are provided by Defendant to the permittees.

46. Since 2000, Defendants have approved or are in the process of approving the major expansion of oil and gas activities within the PAPA and surrounding areas in Western Wyoming and Northern Colorado and Utah outside of the parameters provided in the PAPA EIS and ROD. In 2004, Defendants granted Questar Exploration and Development Company a "Finding of No Significant Impact" to conduct drilling on a year round basis on approximately 14,160 acres in the northern portion of the PAPA.

47. Notwithstanding the major restrictions under the original PAPA EIS and ROD on oil and gas drilling activities, Defendants have granted an exception in almost every case for more extensive and unrestricted oil and gas exploitation in the PAPA.

48. Defendants have also granted additional major oil and gas exploitation operations in the Pinedale Resource Management Area (just outside of the PAPA) referred to as "Jonah I," "Jonah II."

49. The BLM under the direction of Defendant Robert Bennett is in the process of preparing an EIS for a major expansion of oil and gas exploitation in an area referred to as the "Atlantic Rim," which is in the BLM's Rawlins Wyoming District. This new project anticipates 2000 deep conventional wells on 270,080 acres to be developed over a 20 year period within an estimated project life of 30 to 50 years.

50. At the request of numerous energy companies and permittees, Defendants are now developing a "supplemental EIS" (SEIS) for a staggering number of additional wells, in upwards of 4,399 wells on up to 12,278 acres of new disturbance, including well

pads, roads, pipelines and other ancillary facilities within the PAPA – activity which will occur on a year round basis and will be "long-term." The draft SEIS acknowledges that oil and gas exploitation approved under the 2000 EIS and ROD have already reached its allowed capacity in only six years, and would propose increasing that activity more than seven fold. The draft SEIS proposes eliminating many of the limitations and protections provided under the 2000 PAPA ROD.

51. The massive and acceleration of oil and gas activities occurring or proposed within the PAPA and surrounding regions is well beyond the original contemplation of the PAPA ROD and EIS. This original EIS is therefore inadequate in its consideration of the impacts of these actions to man and the environment. Further, it is inappropriate for Defendants to prepare a SEIS that would allow an exponential increase in oil and gas activities when it has allowed for an expansion of the current operations well beyond what was anticipated in the original EIS. The fact that Defendants are now proposing a SEIS after only a short period of time is an indication that the original EIS is an inadequate review of the oil and gas activities in the PAPA and surrounding area.

52. The NEPA review process for the PAPA region has been performed on a "piece meal" basis. The landscape and environment in the PAPA and surrounding area are connected and cumulatively impacted by all of the activity allowed on the public land. Considering only the impacts of each project separately does not provide and adequate or accurate assessment of the impacts to the overall area, and does not fulfill the requirements of NEPA, which calls for a "systematic" and "interdisciplinary" approach toward analyzing significant government actions.

Sage Grouse

53. The sage grouse (*Centrocercus urophasianus)* is a unique species of grouse occurring only in sagebrush-dominated habitats of western North America, including the Pinedale Resource Management Area. This species is the largest upland game bird (excluding turkey) in North America and the second largest grouse in the world.

54. Sage grouse were once widely distributed across the western U.S. and Canada. Unfortunately, sage grouse populations have been declining over the past 30 to 40 years, and sage grouse are currently listed as a sensitive species by BLM. Further, at least seven petitions to protect sage grouse under the Endangered Species Act have been filed with the U.S. Fish and Wildlife Service between 1999 and March 2003, and BLM admits that sage grouse population declines have been significant in recent decades.

55. Sage grouse depend on a variety of sage-steppe habitat throughout their life cycle, and are particularly tied to several species of sagebrush. Sage grouse rely on sagebrush to provide roosting cover and food, and further rely on native forbs to provide food during the spring, summer and fall. Throughout the winter, sage grouse rely almost exclusively on sagebrush for food. The type and condition of the sage-steppe plant communities strongly affect habitat use by sage grouse populations. Sage grouse populations also exhibit strong site fidelity - i.e., loyalty to a particular area. Any degradation of sage grouse habitat can lead to grouse abandoning the area.

56. Sage grouse habitat requirements are well documented. Sage grouse breeding habitats (or leks) typically occur in open areas surrounded by sagebrush. Generally, sage grouse nests are located under sagebrush shrubs having larger canopies and more ground and lateral cover. Grass height is an important factor in maintaining

leks - a minimum of seven inches of residual grass height is needed for productive sage grouse breeding habitat.

57. Oil and gas development is known to adversely affect sage grouse populations and habitat. Clearing of sites, development of roads and other faculties, such as well pads and ponds, and human presence can lead to long-term changes in plant communities and can reduce certain habitat components, which contribute to the health of sagebrush habitat. Issuing oil and gas development permits can result in excessive removal of grass and herbaceous nesting cover.

58. The sage-steppe feature of the Pinedale Resource Management Area in general and the PAPA specifically have historically offered abundant suitable habitat for sage grouse breeding, nesting, rearing, overwintering and other essential biological functions, and historically, numbers of sage grouse were abundant in the area year-round. However, according to recent studies, sage grouse numbers across the PAPA have declined significantly in recent years, and the number of active leks has also declined by an estimated 100 percent in the last 5 years.

59. The U.S. Fish and Wildlife Service has recently concluded that substantial biological information exists concerning the recent and rapid decline in sage-grouse population and habitat to warrant a full status review of the sage grouse to determine whether it should be listed as threatened or endangered under the Endangered Species Act.

60. The failure of Defendants to monitor effects of exceptions granted to the PAPA RMP upon sage grouse has rendered the grouse endangered throughout a significant part of their habitat for purposes of the Endangered Species Act, 16 U.S.C. §

1531 et seq. The failure of Defendants to implement several policies required to be used in order to protect the sage grouse, and issued in a "Statement of Policy" by the Wyoming State Director, which statement was sent by memorandum to all Wyoming BLM field offices on April 16^{th}, 2004. This failure of Defendants to abide by this statement of policy causes undue and unnecessary degradation of natural resources in violation of the "sustained yield" requirement of 43 U.S.C. § 1732 (a), and also violates a Memoranda of Understanding binding on Defendants.

61. The failure of Defendants in the same period to monitor and require mitigation of, produced water ponds and reserve pits throughout the PAPA, in defiance of the advice of, among others, the United States Fish and Wildlife Service, has been the destruction of countless migratory birds, in violation of the Migratory Bird Treaty Act, 16 U.S.C. § 703.

62. The Fish and Wildlife Service has advised defendants that the cumulative effects of defendant's failure to enforce the limitations and mitigation requirements of the PAPA RMP may be irreversible, may require listing of affected species under the Endangered Species Act, may violate Memoranda of Understanding binding on defendants, and should not be extended into other areas prior to completion of effective mitigation measures in areas of the PAPA now under development.

63. The listing of sage grouse as an endangered species will result in widespread restriction and limitation of further oil and gas development in the PRA.

Mule Deer

64. The PAPA provides winter range for 4-5,000 migratory mule deer (*Odocoileus hemionus*) that summer in nearby mountain ranges. Most wintered in the

northern 1/3 of the PAPA, know as the Mesa. The Mesa is bounded by the Green River on the west and the New Fork River, and vegetated primarily by Wyoming big sagebrush and sagebrush-grassland communities.

65. Increased levels of natural gas exploration, development and production in the PAPA have created a variety of adverse effects on mule deer, including direct habitat loss, and physical injuries if deer use areas near roads or well pads.

66. Mule deer are less likely to use or occupy areas in close proximity to well pads than further away. During the last 5 years in the Mesa, changes in mule deer habitat selection as a result of oil and gas development were immediate, with mule deer selected areas further from well pads as development increased.

67. As a result, indirect habitat loss for mule deer on the Mesa substantially exceeds direct habitat loss.

68. Areas of greater mule deer use on the Mesa have become areas of lesser use, extending the range of lesser used areas, and shifting the deer population increasingly to less suitable areas.

69. The result of Defendant's failure to monitor, or to require mitigation, in defiance of the advice and information provided by the public, and in recent scientific publications, has been a documented decrease in the population of mule deer in the PAPA of approximately 46% over two years, and of sage grouse leks in the PAPA of approximately 100% in the same period.

First Cause of Action- FLPMA "multiple use sustained yield"

70. Plaintiffs incorporate herein by reference the allegations of paragraphs 1 through 69 hereinabove.

71. Defendants' failure to follow the requirements set forth in the PAPA RMP is a violation of FLPMA 43 U.S.C 1732, which mandates that the defendants manage the public lands under principles of multiple use and sustained yield, in accordance with developed land use plans.

Second Cause of Action – FLPMA "lack of meaningful involvement"

72. Plaintiffs incorporate herein by reference the allegations of paragraphs 1 through 71 hereinabove.

73. Defendant's failure to coordinate its activities with and provide meaningful involvement for state, federal and local entities and land use plans and programs constitutes a violation of both the PAPA RMP and FLPMA 43 U.S.C. 1712(c)(9).

Third Cause of Action – FLPMA "failure to curtail damaging practices"

74. Plaintiffs incorporate herein by reference the allegations of paragraphs 1 through 73 hereinabove.

75. The failure of Defendants to monitor effects of their practices implementing the PAPA RMP, and to curtail or eliminate such practices which causes drastic loss of habitats and species pending implementation of effective mitigation measures, causes undue and unnecessary degradation of natural resources in violation of the "sustained yield" requirement of 43 U.S.C. § 1732 (a).

Fourth Cause of Action – FLPMA "multiple use and sustained yield"

76. Plaintiffs incorporate herein by reference the allegations of paragraphs 1 through 75 hereinabove.

77. The practice of Defendants of permitting regular, wholesale exceptions to the PAPA RMP, which eliminate its integrity and effectiveness, without public scrutiny,

violates FLPMA, the "public involvement" requirement of 43 U.S.C. § 1712 (a)., and the multiple use and sustained yield requirement of 43 U.S.C. § 1732 (a).

Fifth Cause of Action – FLPMA "public involvement"

78. Plaintiffs incorporate herein by reference the allegations of paragraphs 1 through 77 hereinabove.

79. Defendants' failure to appoint and maintain, and to credit the advice of, an Advisory Committee for the PAPA RMP violates FLPMA, including the "public involvement" requirement of § 43 U.S.C.§ 1712 (a).

Sixth Cause of Action – CFR "consistency requirements"

80. Plaintiffs incorporate herein by reference the allegations of paragraphs 1 through 79 hereinabove.

81. Defendants' failure to maintain the PAPA RMP in conformity with the policies of other federal agencies, such as the United States Fish and Wildlife Service, and of State and local agencies with which the Department of Interior and Bureau of Land Management have Memoranda of Understanding, violates the "consistency" requirement of 43 C.F.R. § 1610.3-2.

Seventh Cause of Action – Migratory Bird Treaty Act

82. Plaintiffs incorporate herein by reference the allegations of paragraphs 1 through 81 hereinabove.

83. Defendants have failed to implement effective monitoring practices with respect to produced water ponds and other facilities permitted by them throughout the PAPA. Meanwhile, monitoring by other agencies, such as the Fish and Wildlife Service of auxiliary facilities has resulted in orders to close nearby produced water ponds which

have destroyed migratory birds and other wildlife. The failure of defendants to implement effective monitoring or mitigation measures with respect to produced water ponds permitted by them throughout the PAPA, resulting in the preventable destruction of migratory birds, violates the Migratory Bird Treaty Act, 16 U.S.C. § 703, as incorporated in the Federal Land Policy and Management Act, 43 U.S.C. § 1732 (b).

Eighth Cause of Action – "irreparable injury"

84. Plaintiffs incorporate herein by reference the allegations of paragraphs 1 through 83 hereinabove.

85. The failure of Defendants to maintain and implement the PAPA RMP threatens immediate and irreparable injury in the imminent and permanent loss of critical habitat and affected species, including at least mule deer and sage grouse. The threat of listing sage grouse as an endangered species entails severe economic consequences to local oil and gas development and those dependent on it for their livelihood.

86. Mitigative measures are, and have always been, immediately available to curtail or eliminate such losses, and have always been required by the PAPA RMP.

87. Injunctive relief requiring cessation of permitting further, or maintaining present oil and gas operations under the PAPA RMP, pending implementation of effective mitigation threatens no legally cognizable harm and serves the public interest as protected by FLPMA.

Ninth Cause of Action NEPA – "significant increase in size and scope"

88. Plaintiffs incorporate herein by reference the allegations of paragraphs 1 through 87 hereinabove.

89. By granting liberal exceptions to and rapidly expanding the oil and gas activities in the PAPA and surrounding resource areas, Defendants have allowed actions far exceeding the contemplated actions under the 2000 PAPA EIS and which have significant impact on the environment. The approved action has changed substantially in size, scope and impact.

Tenth Cause of Action NEPA – "segmenting of environmental impacts"

90. Plaintiffs incorporate herein by reference the allegations of paragraphs 1 through 89 hereinabove.

91. Defendants' piecemeal implementation of mitigation measures in various parts of the Pinedale Resource Area, such as the Jonah Fields, the Mesa, and the Atlantic Rim in the Rawlins District, and the production of separate EA's and EIS's respecting them, inappropriately "segments" the evaluation of the projects and fails to adequately consider cumulative impacts of major federal actions affecting the environment, and is a violation of NEPA.

Eleventh Cause of Action NEPA -- "undue influence of interested parties"

92. Plaintiffs incorporate herein by reference the allegations of paragraphs 1 through 91 hereinabove.

93. Defendants have allowed permittees to unduly influence the decision making and analysis process, including through identification of proposed actions, alternatives, analysis methods, and other, and have failed to ensure accuracy or integrity of the NEPA process.

<u>Twelfth Cause of Action APA – "arbitrary and capricious"</u>

94. Plaintiffs incorporate herein by reference the allegations of paragraphs 1 through 93 hereinabove.

95. The Administrative Procedure Act, 5 USC 705, provides that agency action that is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law" is invalid.

96. Defendants' approval and allowed exceptions of major oil and gas development beyond what was contemplated under the 2000 PAPA EIS and ROD is arbitrary, capricious, an abuse of discretion, and not in compliance with the federal statutes, regulations, and policies set out in allegations 1 through 87 above.

97. Consequently, Defendants' allowance of such activities is arbitrary, capricious, an abuse of discretion, and otherwise not in accordance with law.

PRAYER FOR RELIEF

WHEREFORE, Plaintiffs pray that the Court enter its Order herein forthwith:

a. Determining that Defendants' failure to maintain and implement the PAPA RMP violates FLPMA, and laws implemented thereby, including the Endangered Species Act and Migratory Bird Treaty Act; and

b. Ordering the cessation of further such practices of defendants under the PAPA RMP pending implementation and success of appropriate mitigation measures to halt and repair on-going undue and unnecessarily degradation of natural resources; and

c. Ordering the cessation of procedures to relax or eliminate the limitations upon development contained in the PAPA RMP pending success of mitigative measures implementing the present RMP and Area by production of a general EIS;

d. Ordering a region wide EIS that contemplates all of the current and proposed oil and gas activities in the Pinedale Resource Area and connected areas.

e. Ordering a cessation of the PAPA SEIS process pending the outcome of this claim and other measures requested above; and

f. Granting such other and further relief as the Court deems just in the premises.

Dated: July 23, 2007

Michael D. Gaffney, ISB No.3558
Lance J. Schuster, ISB No. 5404
Of BEARD ST. CLAIR GAFFNEY P.A.
Attorneys for Plaintiffs

EXHIBIT A

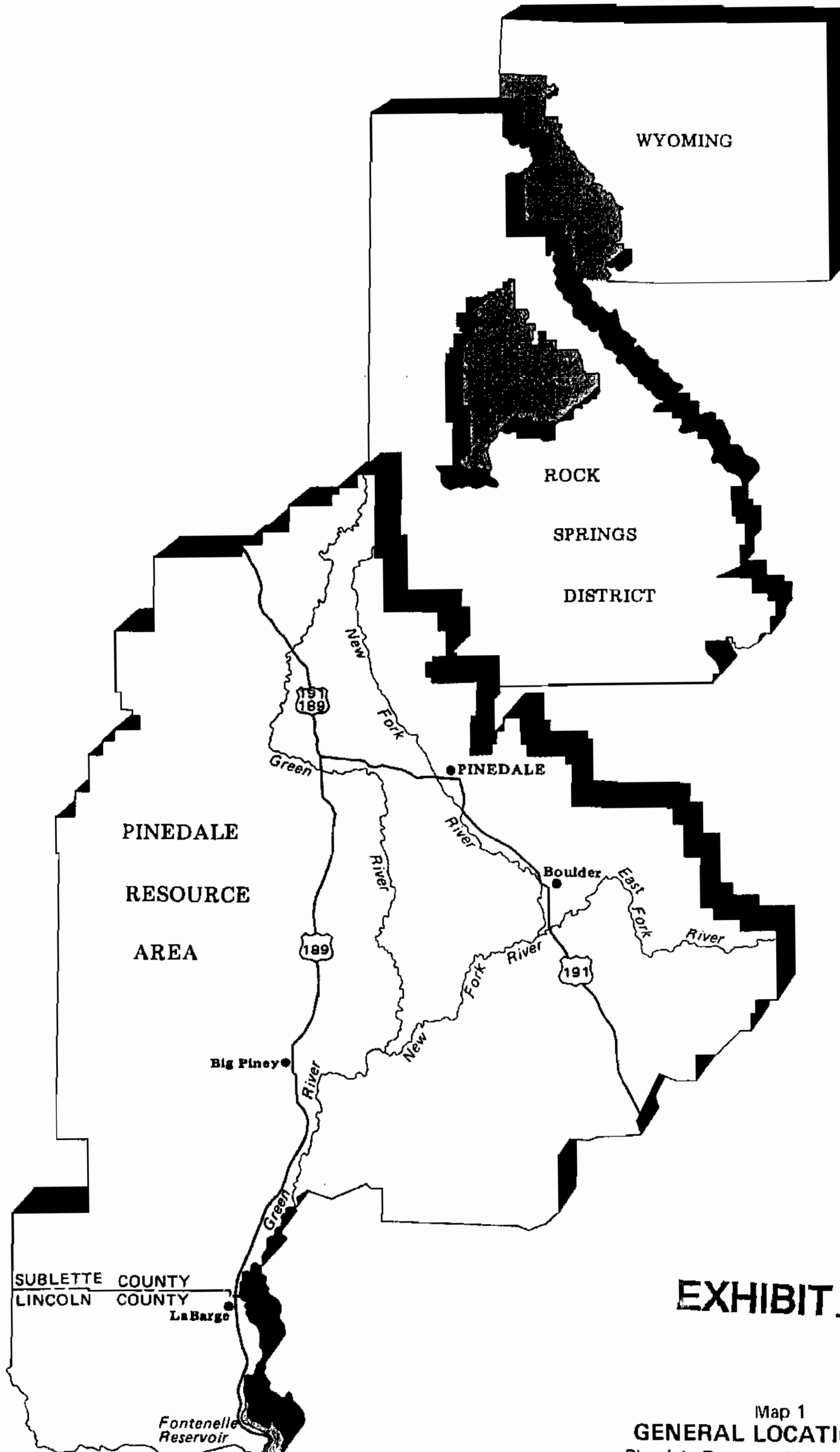

EXHIBIT A

Map 1
GENERAL LOCATION MAP
Pinedale Resource Management Plan

EXHIBIT B

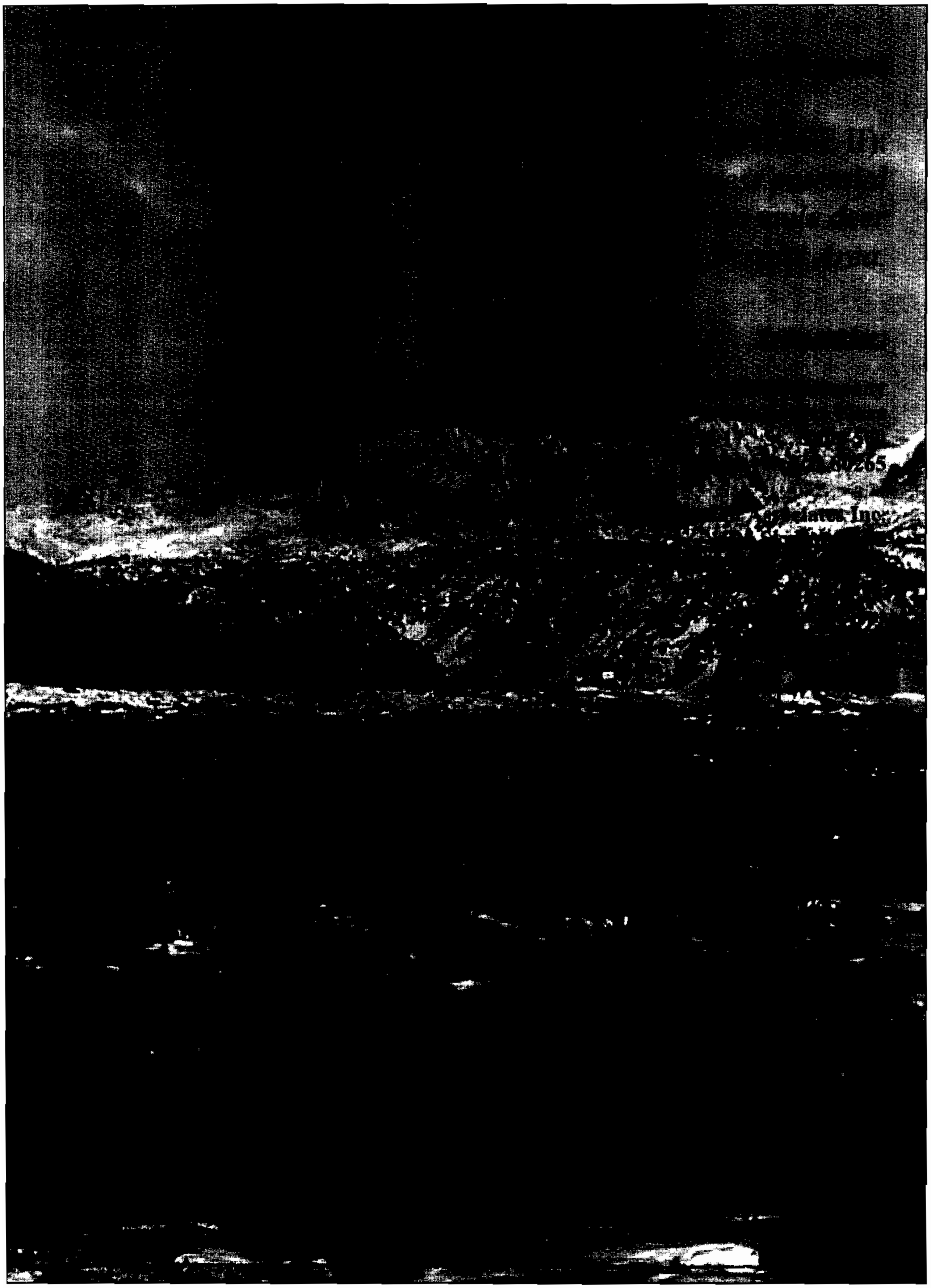

EXHIBIT B

Sawyer, H., R. Nielson, D. Strickland, and L. McDonald. 2005. 2005 Annual Report. Sublette Mule Deer Study (Phase II): Long-term monitoring plan to assess potential impacts of energy development on mule deer in the Pinedale Anticline Project Area. Western Ecosystems Technology, Inc. Cheyenne, WY.

ACKNOWLEDGEMENTS

Phase II of the Sublette Mule Deer Study has been a cooperative effort among agencies and industry. This project was largely funded by Questar Exploration and Production Company (QEP) and subcontracted through TRC Mariah Associates Inc. (TRC). The Pinedale Field Office of the Bureau of Land Management (BLM) provided additional funding and the Wyoming Game and Fish Department (WGFD) provided logistical support, project assistance, and in-kind donations in the form of data collection. Many thanks to Ron Hogan (QEP), Jane Seiler (QEP), Steve Belinda (BLM), Karen Rogers (BLM), Craig Kling (TRC), Scott Smith (WGFD), Herb Haley (WGFD), Bernie Holz (WGFD), Scott Edberg (WGFD), Scott Werbelow (WGFD), Dan Stroud (WGFD), Dean Clause (WGFD), Dennis Almquist (WGFD), Brad Hovinga (WGFD), Doug McWhirter (WGFD), Fred Lindzey (retired), Jim Pope (Leading Edge Aviation), Wes Livingston (Leading Edge Aviation), and Gary Lust (Mountain Air). Thanks to John Amos (SkyTruth) for image acquisition and processing.

LIST OF ACRONYMS

BACI	Before-After Control-Impact
BLM	Bureau of Land Management
CR	County Road
DAU	Data Analysis Unit
EIS	Environmental Impact Statement
GIS	Geographic Information System
GPS	Global Positioning System
MCP	Minimum Convex Polygon
MWRC	Mesa Winter Range Complex
NEPA	National Environmental Policy Act
NGO	Non-Government Organization
PAPA	Pinedale Anticline Project Area
PFWRC	Pinedale Front Winter Range Complex
QEP	Questar Exploration and Production Company
ROD	Record of Decision
RSPF	Resource Selection Probability Function
TPB	Trapper's Point Bottleneck
TRC	TRC Mariah Associates, Inc.
USGS	United States Geological Survey
UW	University of Wyoming
VHF	Very High Frequency
WEST	Western EcoSystem Technology, Inc.
WGFD	Wyoming Game and Fish Department

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES (cont.)

LIST OF FIGURES (cont.)

LIST OF PHOTOS

1.0 OVERVIEW

In 1998 the Wyoming Cooperative Fish and Wildlife Research Unit began the Sublette Mule Deer Study, a collaborative effort with industry, agencies, and private organizations intended to examine movement patterns and population characteristics of the Sublette mule deer herd in western Wyoming. Although a variety of agencies and non-government organizations (NGOs) contributed to the study, it was funded largely by industry (Ultra Petroleum). Concurrently, the Bureau of Land Management (BLM), in compliance with the National Environmental Policy Act (NEPA), initiated an Environmental Impact Statement (EIS) to assess natural gas development in the 300-mi^2 Pinedale Anticline Project Area (PAPA) (BLM 2000) (Figure 1.1). Because the PAPA provides important winter range to a large segment of the Sublette mule deer herd, there were concerns about the potential effects gas field development may have on the deer population.

The Sublette Mule Deer Study was originally designed to have two phases. The first phase of the study was intended to gather information needed by agencies to improve management of the Sublette deer herd, including the identification of seasonal ranges, determination of migration routes, and estimation of survival rates (Sawyer and Lindzey 2001). Additionally, these data were collected so that pre-development information on the mule deer population would be available if Phase II of the study materialized. Phase II was envisioned as a long-term study that would examine the potential impacts of energy development on mule deer, using treatment and control areas, with energy development as the treatment. The BLM completed the PAPA EIS and released their record of decision (ROD) in July of 2000 (BLM 2000). Phase I of the Sublette Mule Deer Study was completed in March of 2001 (Sawyer and Lindzey 2001). Following a 1-year pilot study funded by QEP, Phase II was initiated in December of 2002, as a Before-After/Control-Impact (BACI) study design (Green 1979, Morrison et al. 2001) that uses the PAPA as a treatment area and a portion of the Pinedale Front as the control area. Mule deer population characteristics (i.e., survival, reproduction, abundance) and habitat use in relation to development features will be measured in both areas, and over time, performance of mule deer in the PAPA will be compared to those in the control area, both before and after the treatment. This report summarizes the results from the 2005 study period.

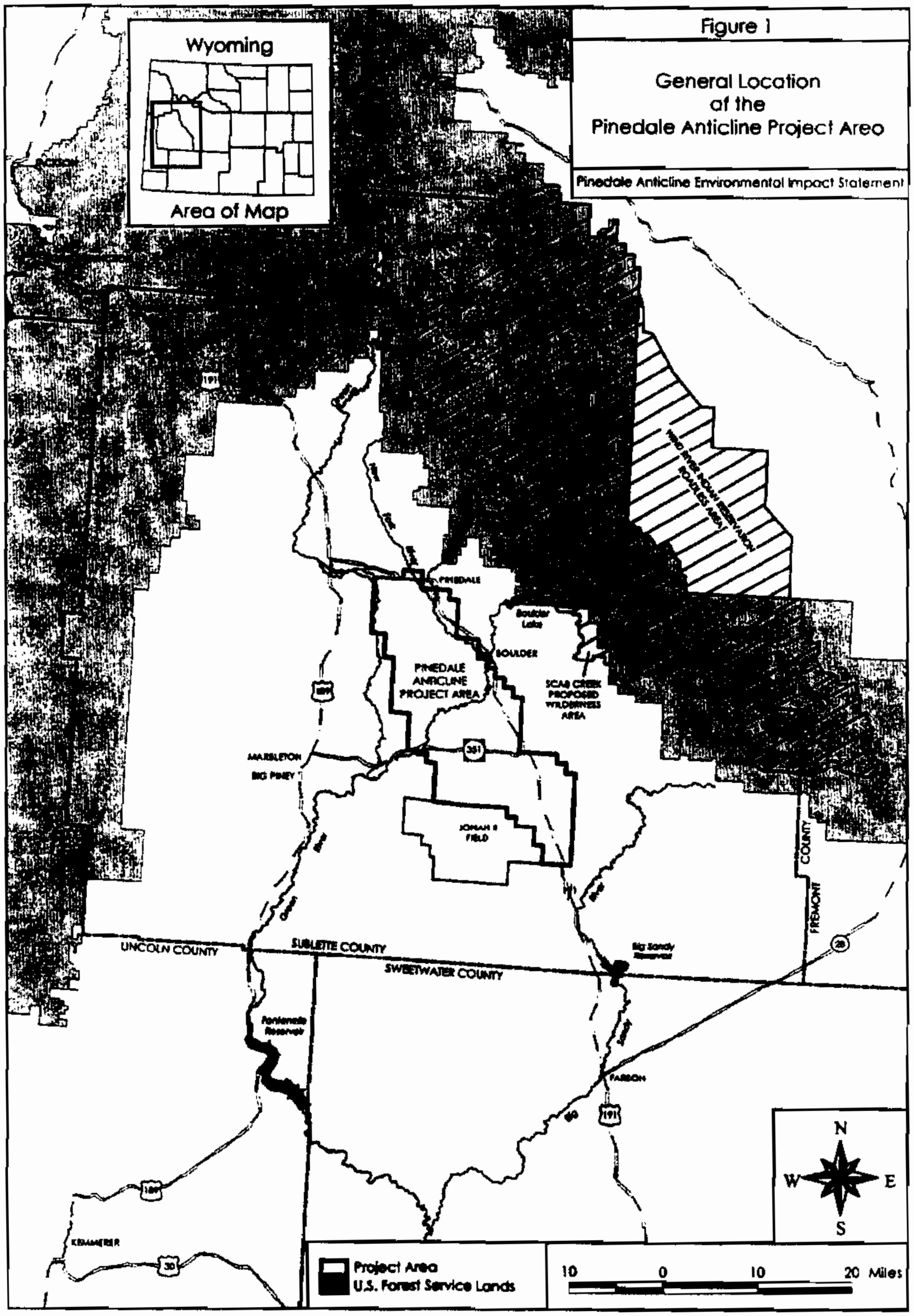

Figure 1.1 Location of Pinedale Anticline Project Area in western Wyoming (from BLM 2000).

2.0 SUBLETTE MULE DEER STUDY

2.1 INTRODUCTION

Western Wyoming is home to the largest, most diverse ungulate populations in the Rocky Mountain region. Maintenance of these populations and protection of their habitats are primary concerns among the public and state and federal agencies. Because of their large numbers and economic importance, mule deer continue to be a top priority for the Wyoming Game and Fish Department (WGFD). The Sublette mule deer herd unit includes 15 hunt areas (130, 138-142, 146, 150-156, and 162) and has a post-season population objective of 32,000 (WGFD 2002). Results from the Sublette Mule Deer Study (Sawyer and Lindzey 2001) indicate that these mule deer seasonally migrate 60-100 miles from winter range near Pinedale, Wyoming to summer in portions of the Salt River Range, Wyoming Range, Wind River Range, Gros Ventre Range, and Snake River Range. During the lengthy spring and fall migrations, mule deer spend a substantial amount of time, often 4-5 months out of the year, on mid-elevation transition ranges that connect summer and wintering areas. By late-fall, most mule deer annually converge in the Green River Basin to winter in one of two major complexes; the Mesa Winter Range Complex (the Mesa) and the Pinedale Front Winter Range Complex (the Pinedale Front) (Figure 2.1). Generally, the Mesa includes the PAPA and those wintering areas west of US 191, while the Pinedale Front includes those areas east of US 191 to the base of the Wind River Mountains.

Population parameters measured during the 3-year (1998-2000) Phase I study (WGFD 2002, Sawyer and Lindzey 2001) suggested the Sublette deer herd was a healthy and productive population prior to development of energy resources on the PAPA. Annual survival rates of radio-collared adult females (n=149) averaged 85% and were consistent with populations studied in other western states (Unsworth et al. 1999). Fawn:doe ratios, an indicator of reproductive success, were among the highest in the state, averaging >75 fawns per 100 does for the study period and approximately 70 fawns per 100 does over the last decade (WGFD 2002). Although the Sublette deer herd has been very productive in the past and recent studies have improved management, this deer herd is similar to others in the region in that habitat loss due to urban expansion and energy development continue to create major management concerns.

Natural gas production in Wyoming has steadily increased since the mid-1980s, particularly in the five counties that form the southwest quarter of the state: Sublette, Fremont, Lincoln, Uinta, and Sweetwater (BLM 2002). This area of the state contains some of the largest and most productive gas fields in the nation, including the Jonah, Continental Divide/Wamsutter, Fontenelle, Big Piney-LaBarge, Moxa Arch, Riley Ridge, Desolation Flats, and the Pinedale Anticline. Natural gas exploration, development, and production are at an all time high in Wyoming and expected to increase.

Because the PAPA encompasses the Mesa, which is used by thousands of mule deer, pronghorn, and sage grouse, development of this area may have adverse impacts on wildlife. Impacts to wildlife include direct habitat loss to infrastructure (i.e., roads, well pads, pipelines) construction and indirect habitat losses that may occur if deer use declines (i.e., avoidance or displacement) in areas near infrastructure. The best way to evaluate the impact(s) of energy development on wildlife populations is through long-term studies where pre-development data, such as, estimates of survival and reproduction are available. Because these studies are by necessity observational, determining cause and effect relationships is very difficult. Simply documenting a behavioral response (e.g.,

avoidance, acclimation, displacement) to a disturbance adds very little to our knowledge of the impact, if it cannot be linked to the survival or reproductive success of the species involved. And conversely, documenting a change in reproduction or survival does not add significantly to our understanding of the impact if the cause (e.g., weather, habitat loss, disease) of the change cannot be determined. And, because of the difficulty with designing and funding long-term studies, impacts of energy development on free-ranging ungulate populations are poorly understood and often debated. However, both direct and indirect habitat losses associated with energy development have the potential to affect ungulate population dynamics, particularly when disturbances are concentrated on winter ranges, where energetic costs are great and animals occur at high densities.

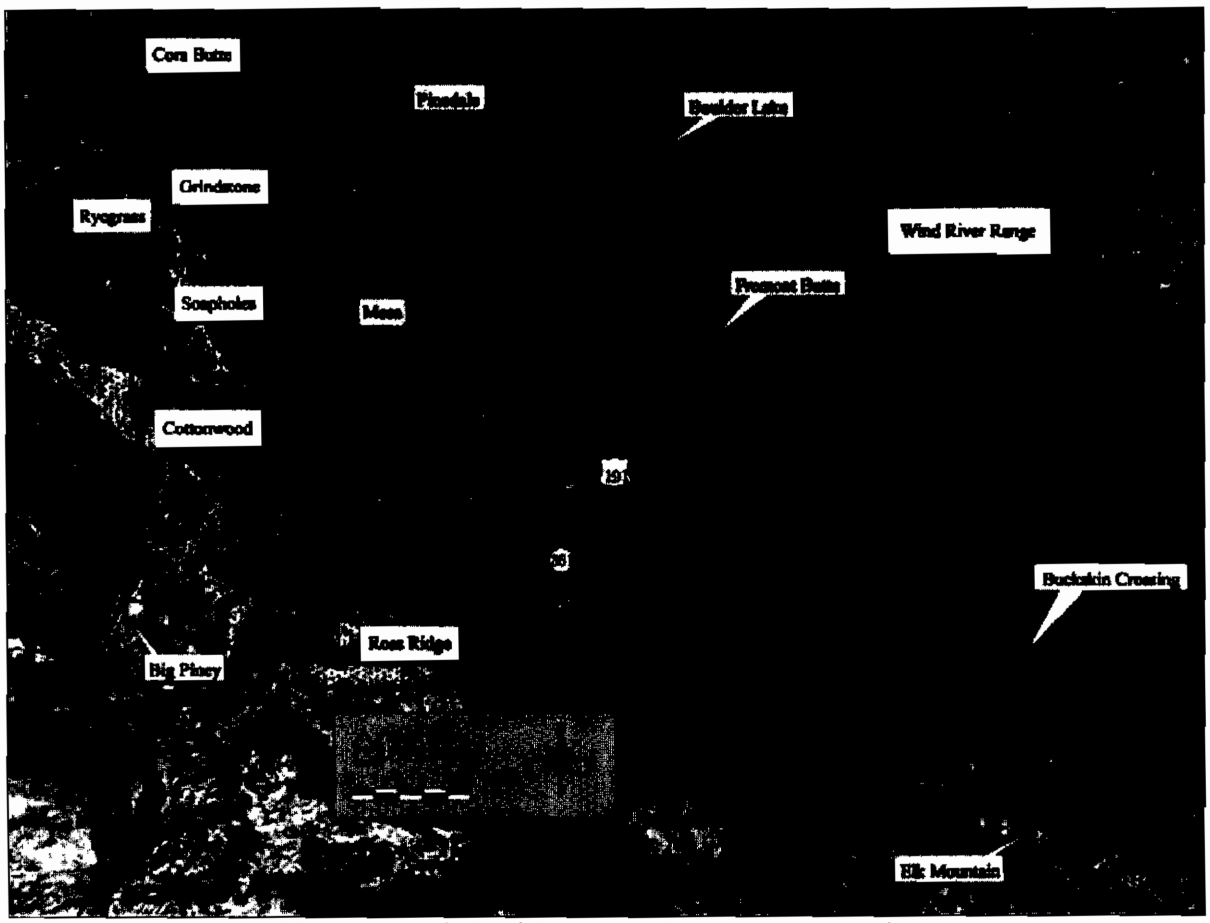

Figure 2.1 Location of the Mesa and Pinedale Front Winter Range Complexes.

The major shortcoming of efforts to evaluate the impact(s) of disturbances on wildlife populations is that they seldom are addressed in an experimental framework, but rather tend to be short-term and are almost always observational. Brief, post-development monitoring plans associated with regulatory work generally result in little or no information that allow agencies and industry to assess impacts on wildlife or identify new, and potentially more effective, mitigation measures. On the other hand, long-term studies are difficult to implement because they are expensive and require interagency and industry cooperation and commitment. Additionally, the acquisition of pre-development data on movement patterns and population characteristics, and identification of suitable control and treatment areas is extremely uncommon. The situation in the PAPA and upper

Green River Basin is unique because most of the necessary information is available to conduct a BACI study to suggest if, and if so, how natural gas development affects the PAPA mule deer population.

The basic idea with a BACI study design is that the potentially impacted (treatment) site is sampled both before and after the time of the disturbance (e.g., energy development), and one or more control sites that do not receive any disturbance are sampled at the same time (Manly 2001). The assumption is that any naturally occurring changes will be similar at the control and treatment sites, and in the absence of the treatment the parameters of interest will be similar for both areas, or at least the magnitude of the differences will be relatively constant from year to year. Thus, potential changes at the treatment site may be attributed to the disturbance. It is not critical that the control and treatment populations be identical, only that the subpopulations are independent and that both respond to the same environmental factors.

For this study, energy development on the Mesa is considered the treatment and a portion of the Pinedale Front serves as the control area. The Pinedale Front consists mostly of federal lands located along the southwest portion of the Wind River Range, where no energy development is anticipated. The Pinedale Front is a suitable control site because: 1) there is little or no exchange of deer between the Mesa and Pinedale Front, 2) the two deer subpopulations use separate winter ranges, but share common transition and summer ranges, so they have comparable foods available during parturition and arrive on winter ranges in similar condition, 3) although the two deer subpopulations occupy distinct winter ranges, they are in close proximity to one another (15-30 miles), so both are exposed to similar weather patterns and environmental conditions, 4) habitat characteristics on both winter ranges are similar and dominated by sagebrush communities, and 5) population characteristics of the two subpopulations have consistently tracked one another prior to development of the PAPA.

We believe four population parameters should be monitored to detect the potential impacts of energy development on mule deer, including: 1) adult doe survival, 2) over-winter fawn survival, 3) reproduction, and 4) abundance. As these parameters are measured in treatment and control areas, comparisons can be made, and over time, the potential impacts of energy development on mule deer may be assessed. If mule deer in the PAPA continue to function as well as before development and as well as those in the control area it would suggest that energy development has no adverse impacts on mule deer in the region. If however, mule deer survival or reproduction in the PAPA decreases, while the same parameters in the control area remain unchanged or increase, then energy development may be the cause of those declines. Again, this does not demonstrate a cause-effect relationship; rather it is simply one piece in a weight of evidence approach, where our study design examines several direct (e.g, survival, reproduction) and indirect (e.g., habitat use, displacement) parameters that are statistically analyzed and carefully interpreted.

Results from Phase I identified seasonal migration routes and distribution of deer in the Mesa and Pinedale Front (Sawyer and Lindzey 2001). Although mule deer migrations of >60 miles have been reported in parts of Idaho (Thomas and Irby 1990) and Montana (Mackie et al. 1998), mule deer on and adjacent to the PAPA are likely the most migratory deer in the western states, annually migrating 60-100 miles between winter and summer ranges. Because these deer are highly mobile and demonstrate strong fidelity to seasonal ranges, the potential for energy development, or other human disturbances, to disrupt migratory routes and/or winter distribution patterns exists. While changes in distribution or migratory patterns may not necessarily result in decreased deer survival or

reproduction, it is useful to include within the monitoring plan to: 1) document if migration routes remain intact, 2) document if deer continue using pre-development winter ranges, 3) provide industry and agencies with accurate, precise movement data for site-specific analyses (e.g., seasonal range designation or comparison of effects of multiple well pads versus single well pad), 4) identify mitigation opportunities on and off-site treatment and control areas (e.g., migration corridors, habitat improvements), and 5) allow for analyses that estimate and describe indirect habitat loss (e.g., avoidance of roads or well pads) or changes in habitat use.

Properly designed long-term monitoring and examination of adult survival, over-winter fawn survival, reproduction, abundance, and seasonal distribution/movement patterns will allow for population-level inferences concerning the potential impacts of energy development on mule deer.

2.2 STUDY AREA

The PAPA is located in west-central Wyoming in Sublette County, near the town of Pinedale (Figure 1.1). The PAPA is characterized by sagebrush communities and riparian habitats associated with the Green and New Fork Rivers. Elevations range from 6,800 to 7,800 feet. The PAPA consists primarily of federal lands (80%) and minerals (83%) administered by the BLM. The state of Wyoming owns 5% (15.2 mi^2) of the surface and another 15% (46.7 mi^2) is private. Aside from the abundant energy resources, the PAPA is an important area for agriculture and provides winter range for 4,000-6,000 mule deer, 2,000-3,000 pronghorn, and 3,000-4,000 sage grouse. While the project area is fairly large, most deer occur in the northern portion of the PAPA, an area locally known as "The Mesa", which includes approximately 100-mi^2. In July of 2000, the BLM approved the development of 700 producing well pads in the PAPA and recognized that this may require as many as 900 well pads to be constructed and drilled (BLM 2000). Additionally, 401 miles of pipeline and 276 miles of access roads were approved for development of energy resources on the PAPA.

2.3 METHODS

2.3.1 Deer Capture

Helicopter net-gunning was used to capture deer across winter ranges in treatment (Mesa) and control (Pinedale Front) areas. Captured deer were fitted with collars supporting either a GPS or VHF radio transmitter. Both types of collars were equipped with mortality sensors that change pulse rate if the collar remains stationary for more than 8 hours. The VHF collars (Advanced Telemetry Systems, Isanti, MN) were duty-cycled to transmit signals October 1 through May 31. The GPS collars (Telonics, Mesa, AZ) were store-on-board units capable of storing approximately 3,000 locations and programmed to obtain fixes every 2 hours during winter months (November-April) and every 25 hours during the remainder of the year. Additionally, each GPS collar was equipped with a remote release mechanism programmed to activate at a specified time, so that collars could be retrieved and data downloaded.

2.3.1 Winter Movement and Distribution Patterns

Data collected from GPS-collared deer accurately identified winter distribution, movement patterns, and migration routes of the marked deer on and adjacent to winter ranges. Because a portion (n=17) of GPS collars are to remain on the same deer for consecutive winters (2004-05

and 2005-06), some data for the 2004-05 winter will not be available until 2006.

2.3.3 Population Characteristics

2.3.3.1 Abundance and Density Estimates

Deer abundance and density were estimated in treatment (Mesa) and control (Pinedale Front) areas using aerial counts of deer in systematically sampled 1-mi^2 quadrat units. Winter distribution data collected from radio-collared deer in the study area between 1998 and 2003 was used to delineate 68-mi^2 and 70-mi^2 sampling frames for the treatment and control areas, respectively. Sampling frames were expected to contain high-densities of deer so stratification was unnecessary. We sampled 34 quadrats from each sampling frame, covering approximately 50% of the geographic area. Equations used to calculate abundance and density estimates were taken from Thompson et al. (1998). Standard 90% confidence intervals were calculated using a Z statistic.

The size of the sampling frame in the control area has changed over the course of the study (See Section 2.4.4.1). During the first year of surveys (2002) we identified a 35-mi^2 sampling frame that we believed represented the core winter range in the Pinedale Front. During 2003 we made some slight modifications to improve our sampling and used a similar 38-mi^2 sampling frame (Figure 2.2). However, during the 2003 surveys many of our marked deer moved out of the sampled area. At this time it became apparent that these deer utilize a much larger area than we originally thought. To accurately adjust the size and extent of our sampling frame we conducted a telemetry flight prior to the 2004 survey to adjust the size of our sampling frame based on locations of marked deer. The new sampling frame was 70-mi^2 (Figure 2.3), nearly double the size of the 2002 and 2003 frames and approximately the same size as the sampling frame for the treatment area.

Group size and vegetative cover may significantly influence visibility bias in ungulate helicopter surveys (Samuel et al. 1987). However, the treatment and control areas for this study consist of homogenous sagebrush stands with no tree cover. Additionally, telemetry data from Phase I indicated male and female deer did not winter in areas with different habitat characteristics, so potential group size variation resulting from sexual segregation should not influence counts. Further, when survey areas contain large concentrations of animals that are widely distributed, recognition of individual groups may be near impossible. Attempting to determine visibility correction factors for groups is likely not feasible in these situations (Samuel et al. 1987). Counts of animals within the sampled quadrats are assumed to provide valid indices on density and abundance. That is, if not all animals present were detected, we assume the same visibility bias in both treatment and control areas over time.

Counts were conducted from a piston-powered Bell helicopter flown approximately 100-150 feet above ground and at speeds of 20-40 knots. The northeast UTM coordinates for each quadrat were programmed into a GPS unit on the helicopter. Quadrat perimeters were then flown clockwise, such that the observer was positioned on the inside, while the pilot navigated. A real-time flight path was traced into the on-board GPS and once the perimeter was established the quadrat interiors were systematically searched. Observer and navigator collectively detected deer groups and determined whether groups were inside or outside quadrat boundaries. Deer detected inside and moving out were considered in the quadrat, while deer detected outside and moving in the quadrat were considered out. Half of the deer detected on perimeter boundaries were considered in the quadrat. For each quadrat, the observer recorded total number of deer, number of deer groups, and total

search time.

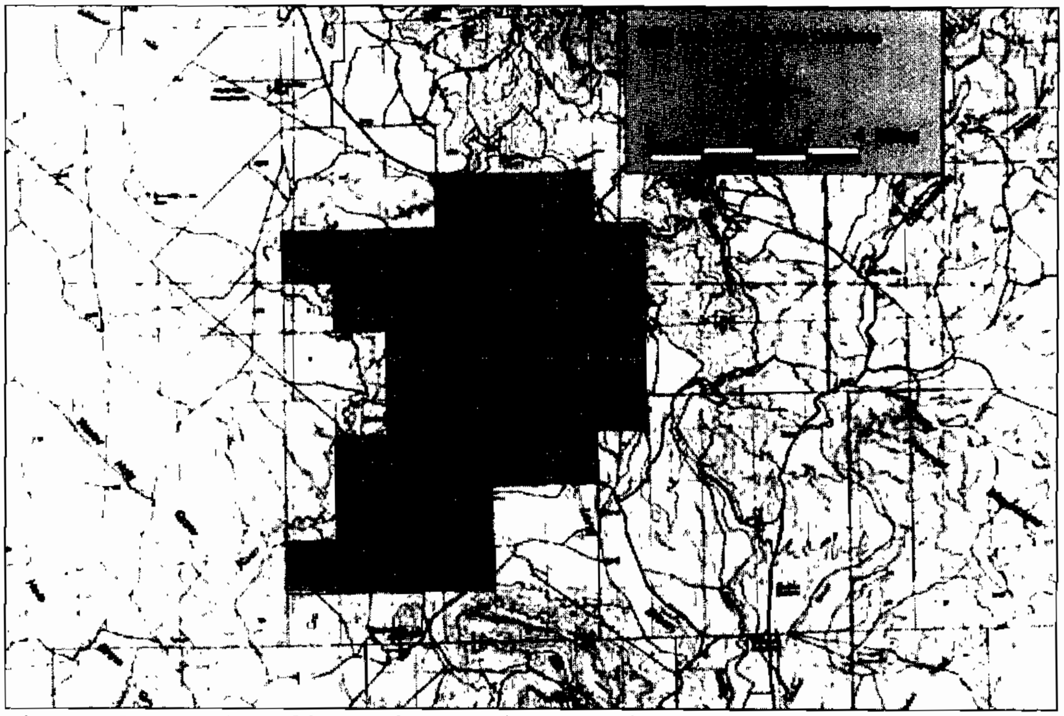

Figure 2.2 Location of 38 quadrats used in control area during 2003 helicopter surveys.

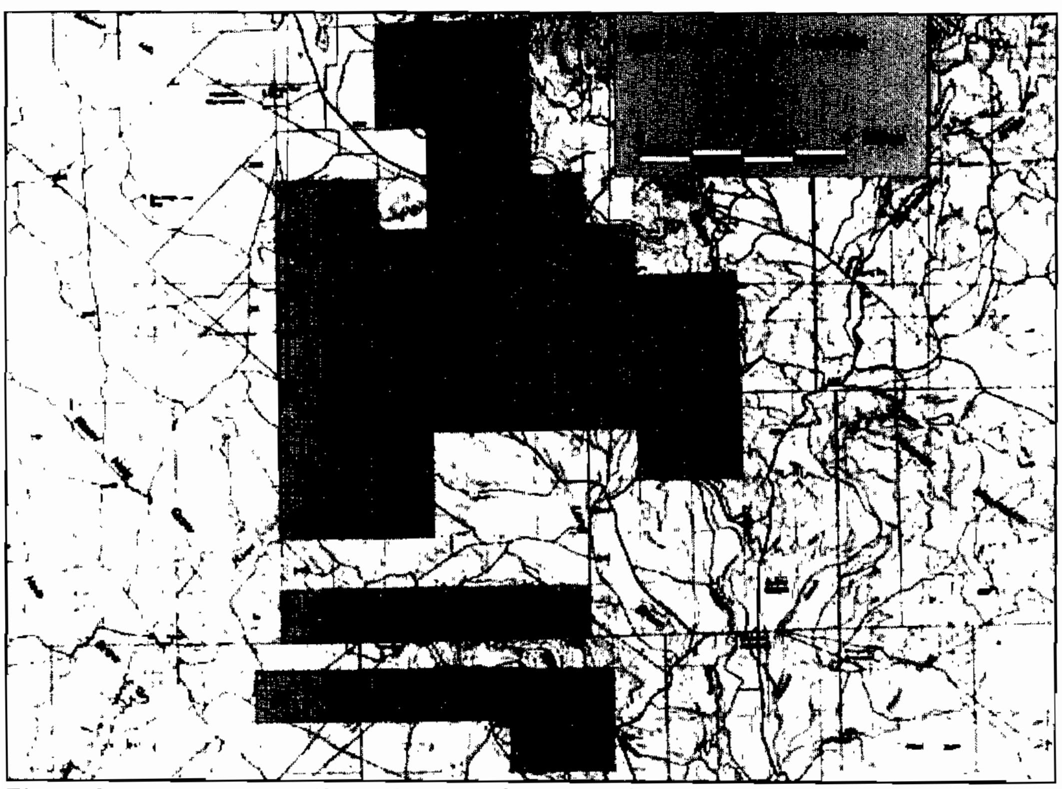

Figure 2.3 Location of 70 quadrats used in control area during 2004 helicopter surveys.

2.3.3.2 Reproduction

Doe:fawn ratios are commonly used as an index to herd productivity or reproduction. Doe:fawn ratios were calculated from composition data collected during the WGFD's annual helicopter surveys in December, consistent with the previous 10 years of WGFD data collection (WGFD 2002). Sample sizes were adequate to obtain desired levels of precision in ratio estimates (Czaplewski et al. 1983).

2.3.3.3 Adult Female Winter Survival

Adult doe survival was estimated from telemetry records using the Kaplan-Meier procedure (Kaplan and Meier 1985). We attempted to maintain a sample of 30 marked deer in both control and treatment areas. Marked deer were located at least once per month, December through May.

2.3.3.4 Over-winter Fawn Survival

Deer from both the Mesa and Pinedale Front congregate on the northern ends of their respective winter ranges every spring which allows large numbers (>1,000) of animals to be counted and classified. Ground-based composition surveys conducted in April were used to calculate post-winter adult:fawn ratios. These data were used in conjunction with adult survival rates and December adult:fawn ratios to estimate over-winter fawn survival, using the change-in-ratio estimator from White et al. (1996):

$\hat{S}_f = \hat{S}_a x \frac{B}{A}$, where A = count of December fawns/count of December adults

B = count of April fawns/count of April adults

$\hat{S}_a$ = estimate of adult survival

Adult survival rates were estimated from telemetry records, rather than carcass counts. The delta method (Seber 1982) was used to estimate variance.

2.3.4 Direct Habitat Loss

Satellite imagery and geographic information system (GIS) software were used to digitize road networks and well pads associated with natural gas development in the northern portion of the PAPA (i.e., The Mesa), from 2000 through 2003. Areas within the PAPA, but outside the Mesa were not considered. Landsat images were purchased from the United States Geological Survey (USGS) and processed by SkyTruth (Sheperdstown, West Virginia, USA). Images were generally obtained in early fall (i.e., September-October), after most annual construction activities (e.g., well pad and road building) were complete, but prior to snow accumulation. Pipelines and seismic tracks were not included in this analysis. Roads and well pads were digitized in ArcView®(ESRI, Redlands, California, USA). Length of road segments and size of well pads were calculated in ArcView®. Acreage estimates associated with road networks were based on an average road width of 30 ft. We recognize there is some error associated with the digitizing process, however it is expected to be minimal and the resulting digital GIS coverages

are considered the best available data. During the digitizing process we assumed full reclamation of well pads had not occurred, since the gas field is only 3 years old and successful reclamation (i.e., re-establishment of native plant species) of native shrub communities in arid environments is extremely difficult and unlikely to occur during a short time period.

2.3.5 Resource Selection

2.3.5.1 Study Area Delineation

We defined the study area by mapping 39,641 locations from 77 mule deer over a 6-year period (1998 to 2003), creating a minimum convex polygon (MCP), and then clipping the MCP to the boundary of the PAPA. This was consistent with McClean et al. (1998)'s recommendation that study-area level of habitat availability should be based on the distribution of radiocollared animals. Additionally, the MCP generated from GPS data was consistent with winter distribution patterns documented for this deer population using >60 VHF radio-collars, between 1998 and 2000 (Sawyer and Lindzey 2001).

2.3.5.2 Predictor Variables

We identified 5 variables as potentially important predictors of winter mule deer distribution, including: elevation, slope, aspect, road density, and distance to well pad. We did not include vegetation as a variable because the sagebrush-grassland was relatively homogeneous across the study area and difficult to divide into finer vegetation classes. Further, we believed differences in sagebrush characteristics could be largely explained by elevation, slope, and aspect. We used the SPATIAL ANALYST extension for ArcView® to calculate slope and aspect from a 26 x 26 m digital elevation model (USGS 1999). Grid cells with slopes > 2 degrees were assigned to 1 of 4 aspect categories; northeast, northwest, southeast, or southwest. Grid cells with slopes of ≤ 2 degrees were considered flat and assigned to a fifth category that was used as the reference (Neter et al. 1996) during habitat modeling. We obtained elevation, slope, and aspect values for each of the sampled units using the GET GRID extension for ArcView®. The sample units consisted of 4,500 circular units with 100-meter radii distributed across the study area. We annually digitized roads and well pads from LANDSAT® thematic satellite images acquired from the USGS and processed by SkyTruth. The LANDSAT® images were obtained every fall, prior to snow accumulation, but after most annual development activities were complete. We calculated road density by placing a circular buffer with a 0.5 km radius on the center of the sample unit and measuring the length of road within the buffer. We used the NEAREST NEIGHBOR extension for ArcView® to measure the distance from the center of each sampled unit to the edge of the nearest well pad. We did not distinguish between developing and producing well pads. We assumed habitat loss was similar among all well pads because development of the field was in its early stages (i.e., < 5 years) and there was no evidence of successful shrub reclamation. Additionally, there was no evidence that suggested the type of well pad was an accurate indicator of the amount of human activity (e.g., traffic) that occurred at each site. Without an accurate measure of human activity, we believed it was inappropriate to distinguish between producing and developing well pads.

2.3.5.3 Modeling Procedures

Our approach to modeling winter habitat use consisted of 4 basic steps: 1) estimate the relative

frequency of use (i.e., an empirical estimate of probability of use) for a large sample of habitat units for each radiocollared deer during each winter, 2) use the relative frequency as the response variable in a multiple regression analysis to model the probability of use for each deer as a function of predictor variables, 3) develop a population–level model from the individual deer models for each winter, and 4) map predictions of population–level models from each winter. Our analysis treated each winter period separately to allow mule deer habitat use and environmental characteristics (e.g., road density or number of well pads) to change through time. We treated radiocollared deer as the experimental unit to avoid pseudo–replication (i.e., spatial and temporal autocorrelation) and to accommodate population–level inference (Otis and White 1999, Johnson et al. 2000, Erickson et al. 2001).

We estimated relative frequency of use for each radiocollared deer using a simple technique that involved counting the number of deer locations in each of approximately 4,500 randomly sampled circular habitat units across the study area. We took a simple random sample with replacement for each winter to ensure independence of the habitat units (Thompson 1992:51). We chose circular habitat units that had a 100-meter radii; an area small enough to detect changes in animal movements, but large enough to ensure multiple locations could occur in each unit. Previous analyses suggested model coefficients were similar across a variety of unit sizes, including 50, 75, and 150-meter radii (R. Nielson, Western Ecosystems Technology, Inc., unpublished data). We measured predictor variables on of each of the sampled habitat units and conducted a Pearson's pairwise correlation analysis (PROC CORR; SAS Institute 2000) before modeling to identify multicollinearities and determine if any variables should be excluded from the modeling ($|r| > 0.60$).

The relative frequency of locations from a radiocollared deer found in each habitat unit was an empirical estimate of the probability of use by that deer and was used as a continuous response variable in a generalized linear model (GLM). We used an offset term (McCullagh and Nelder 1989) in the GLM to estimate probability of use for each radiocollared deer as a function of a linear combination of predictor variables, plus or minus an error term assumed to have a negative binomial distribution (McCullagh and Nelder 1989, White and Bennetts 1996). We preferred the negative binomial distribution over the more commonly used Poisson, because it allows for over–dispersion (White and Bennetts 1996).

We obtained a population–level model for each winter by first estimating coefficients for each radiocollared deer. We used PROC GENMOD (SAS Institute 2000) and the negative binomial distribution to fit the following GLM for each radiocollared deer during each winter period:

$$\ln(E[r_i]) = \ln(total) + \beta_0 + \beta_1 X_1 + \cdots + \beta_p X_p, \qquad (1)$$

which was equivalent to:

$$\ln(E[r_i / total]) = \ln(E[\text{Relative Frequency}_i]) = \beta_0 + \beta_1 X_1 + \cdots + \beta_p X_p, \qquad (2)$$

where r_i was the number of locations for a radiocollared deer within habitat unit i ($i = 1, 2, \ldots, 4500$), *total* was the total number of locations for the deer within the study area, β_0 was an intercept term, $\beta_1,\ldots,\beta_p$ were unknown coefficients for habitat variables $X_1,\ldots,X_p$, and $E[.]$ denotes the expected value. We used the same offset term for all sampled habitat units of a given deer, thus the term $\ln(total)$ was absorbed into the estimate of β_0 and ensured we were modeling relative frequency of use (e.g., 0, 0.003, 0.0034, …) instead of integer counts (e.g., 0, 1, 2, …). Because some locations for each deer were not within a sampled habitat unit, inclusion of the offset term in equation (1) was not equivalent to conditioning on the total number of observed locations (i.e.,

multinomial distribution). In fact, one could drop the offset term and simply scale the resulting estimates of frequency of use by the total number of observed locations to obtain predictions of relative frequency identical to those obtained by equation (1). This approach to modeling resource selection estimates the relative frequency or absolute probability of use as a function of predictor variables, so we refer to it as a resource selection probability function (RSPF) (Manly et al. 2002).

We assumed GLM coefficients for predictor variable *k* for each deer were a random sample from a normal distribution (Seber 1984, Littell et al. 1996), with the mean of the distribution representing the average or population–level effect of predictor variable *k* on probability of use. We estimated coefficients for the population–level RSPF for each winter using

$$\hat{\bar{\beta}}_k = \frac{1}{n}\sum_{j=1}^{n}\hat{\beta}_{kj}, \tag{3}$$

where $\hat{\beta}_{kj}$ was the estimate of coefficient *k* for individual *j* (*j* = 1,…,n). We estimated the variance of each population–level model coefficient using the variation between radiocollared deer and the equation

$$\text{var}(\hat{\bar{\beta}}_k) = \frac{1}{n-1}\sum_{j=1}^{n}(\hat{\beta}_{kj} - \hat{\bar{\beta}}_k)^2. \tag{4}$$

This method of estimating population–level coefficients using equations (3) and (4) was used by Marzluff et al. (2004) and Glenn et al. (2004) for evaluating habitat selection of Stellar's jays and northern spotted owls, respectively. Population–level inferences using equations (3) and (4) are unaffected by potential autocorrelation because temporal autocorrelation between deer locations or spatial autocorrelation between habitat units do not bias model coefficients for the individual radiocollared deer models (McCullagh and Nelder 1989, Neter et al. 1996).

Standard criteria for model selection such as Akaike's Information Criterion (Burnham and Anderson 2002) might be appropriate for individual deer, but do not apply for building a model for population–level effects because the same model (i.e., predictor variables) is required for each deer within a winter. Therefore, we used a forward-stepwise model building procedure (Neter et al. 1996) to estimate population–level RSPFs for winters 2000–01, 2001–02, and 2002–03. The forward–stepwise model building process required fitting the same models to each deer within a winter and using equations (3) and (4) to estimate population–level model coefficients. We used a *t*–statistic to determine variable entry ($\alpha \leq 0.15$) and exit ($\alpha > 0.20$) (Hosmer and Lemshow 2000). We considered quadratic terms for road density, distance to nearest well pad, and slope during the model building process and, following convention, the linear form of each variable was included if the model contained a quadratic form.

We conducted stepwise model building for all winters except for the pre-development period that included winters 1998–1999 and 1999–2000. The limited number of locations recorded for radiocollared deer during this period precluded fitting individual models. Rather, we estimated a population–level model for the pre-development period by pooling location data across 45 deer that had a minimum of 10 locations. We took simple random samples of 30 locations from deer with >30 locations to ensure that approximately equal weight was given to each deer in the analysis. We fit a model containing slope, elevation, distance to roads, and aspect for the pre-development period. Distance to well pad was not included as a variable in the pre-development model because there were only 11 existing well pads on the Mesa prior to development and most

were >10 years old with little or no human activity associated with them. We used bootstrapping to estimate the standard errors and P values of the pre-development population–level model coefficients.

We mapped predictions of population–level RSPFs for each winter on 100 x 100-meter grids that covered the study area. We checked predictions to ensure all values were in the [0,1] interval, such that we were not extrapolating outside the range of the model data (Neter et al. 1996). The estimated probability of use for each grid cell was assigned a value of 1 to 4 based on the quartiles of the distribution of predictions for each map. We assigned grid cells with the highest 25% of predicted probabilities of use a value of 1 and classified them as high use areas, assigned grid cells in the 51 to 75 percentiles a value of 2 and classified them as medium-high use areas, assigned grid cells in the 26 to 50 percentiles a value of 3 and classified them as medium-low use areas, and assigned grid cells in the 0 to 25 percentiles a values of 4 and classified them as low use areas. We used contingency tables to identify changes in the 4 habitat use categories across the 4 winter periods.

2.4 RESULTS

2.4.1 Deer Capture

We captured and radio-collared 27 adult female deer on December 19, 2004. Deer capture (n=17) in the PAPA was restricted to those areas where deer congregate across the northern end of the PAPA in early winter, as they move onto the Mesa from Trapper's Point and/or the Ryegrass/Grindstone area. We assumed this represented a random sample of deer in the subpopulation because the deer were congregated on the north end, before they moved south to their respective winter ranges. For the same reason, deer capture (n=10) in the Pinedale Front was restricted to the Big Sandy area; bounded to the north and west by the Big Sandy River, east to the Prospects, and south to Elk Mountain. Of the 27 deer captured, 20 were equipped with GPS radio-collars and 7 equipped with traditional VHF radio-collars. All GPS collars were store-on-board units equipped with VHF transmitters on 12-hour duty cycles, 8-hour mortality sensors, and remote-release mechanisms programmed to drop collars on April 15, 2005 or April 15, 2006. The programming schedule for GPS collars was as follows:

- obtain 1 location every 2-3 hours December 20, 2004 – April 15, 2005
- obtain 1 location every 25 hours April 16, 2005 – October 31, 2005
- obtain 1 location every 2-3 hours November 01, 2005 – April 15, 2006

Consistent with previous years, our goal was to maintain a sample size of 30 deer in each area, including 10 GPS and 20 VHF radio-collars (Table 2.1).

Table 2.1 Number and type of radio-collars functioning in treatment and control areas during the 2004-05 winter.

Treatment Area (The Mesa)		**Control Area** (Pinedale Front)	
Deer ID	Collar Type	Deer ID	Collar Type
801	VHF	804	VHF
805[a]	VHF	807	VHF
806	VHF	8071	VHF
809	VHF	811	VHF
813	VHF	818	VHF
815	VHF	820	VHF
817	VHF	821	VHF
822	VHF	825	VHF
827	VHF	833	VHF
830	VHF	835*	VHF
837	GPS	836	VHF
838	GPS	850	VHF
839	GPS	853	VHF
841	GPS	860	GPS
842	VHF	861	GPS
843	GPS	864	GPS
844	GPS	867	GPS
845	VHF	869	GPS
847	GPS	870	GPS
848	GPS	872	GPS
849	VHF	876	GPS
852	VHF	877	GPS
853	VHF	878	GPS
854	VHF		
855	GPS		
8553	VHF		
858	GPS		
859	GPS		
862	GPS		
863	GPS		
865	GPS		
866	GPS		
868	GPS		
870[a]	VHF		
871	GPS		
873	GPS		
874	GPS		
876	GPS		
878	GPS		
884	GPS		
886	VHF		
887	GPS		
889[b]	GPS		
892	VHF		
905[a]	VHF		
989	VHF		
VHF = 22 GPS = 24	Total = 46	VHF = 13 GPS = 10	Total = 23

[a] Radio-collars left over from Phase I (Sawyer and Lindzey 2001).
[b] Missing and not included in survival analysis

2.4.2 GPS Data Collection

We collected data from 17 GPS collars following the 2004-05 winter, including 16 that were released on April 15, 2005 and one (#8.74) that was recovered from a dead deer in early April. One collar (#8.89) that was supposed to be released in 2005 could not be located. Of the 17 collars obtained this year, 10 (#844, #855, #862, #864, #866, #867, #868, #870, #884, and #887) contained data for eonseeutive winters (2003-04 and 2004-05).

Of the 17 collars that were retrieved, all functioned properly and collected the expected number of locations. Consistent with GPS performance in previous years (Sawyer et al. 2004), success rates for GPS fix attempts were very high (99%) and locations precise (88% 3-D locations). A minimum of four satellites are needed to generate 3-D locations, which typically have less than 20-meter error (Di Orio et al. 2003).

2.4.3 Winter Movement and Distribution Patterns

2.4.3.1 Treatment Area (Mesa):

We mapped GPS locations collected from 10 deer that used the Mesa during the 2004-05 winter (Figure 2.4). Data from 8 additional deer were not mapped because their collars will not be recovered until April 15, 2006. Distribution and movement patterns were variable among deer, and generally, deer shifted areas of use through the winter and utilized a large portion of the Mesa.

Figure 2.5 includes locations (r = 3,657) from all 10 deer and illustrates the importance of BLM lands to this mule deer population. Boundaries between private and BLM lands generally correspond with habitat type and topography; with private lands consisting of flat river bottoms and agricultural areas, whereas BLM lands contain sagebrush hills in drier, more rugged terrain. Mule deer demonstrated a strong affinity to the sagebrush-dominated BLM lands.

Consistent with previous years, all deer traveled to the Cora Butte area via the Trapper's Point Bottleneck (TPB) (Sawyer and Lindzey 2001, Sawyer et al. 2004). Figure 2.5 clearly defines the TPB, located 7 miles west of Pinedale, near the junction of US 191, WYO 352, and CR 110. Sawyer and Lindzey (2001) defined bottlenecks as *"those areas along migration routes where topography, vegetation, development and/or other landscape features restrict animal movements to narrow or limited regions."* Bottlenecks create management concerns because the potential to disrupt or threaten established migratory routes are much greater in these areas. This naturally-occurring bottleneck is approximately 1 mile in width and length, restricted to the southwest by the Green River riparian complex and to the northeast by the New Fork/Duck Creek riparian complex. Sagebrush habitats north and south of US 191 are used extensively by mule deer during certain times of the year (Sawyer and Lindzey 2001). Mule deer use the narrow strip of sagebrush connecting the two areas to cross US 191. Development of small, fenced house lots adjacent to BLM lands has narrowed the effective width of the TPB to < ½ mile.

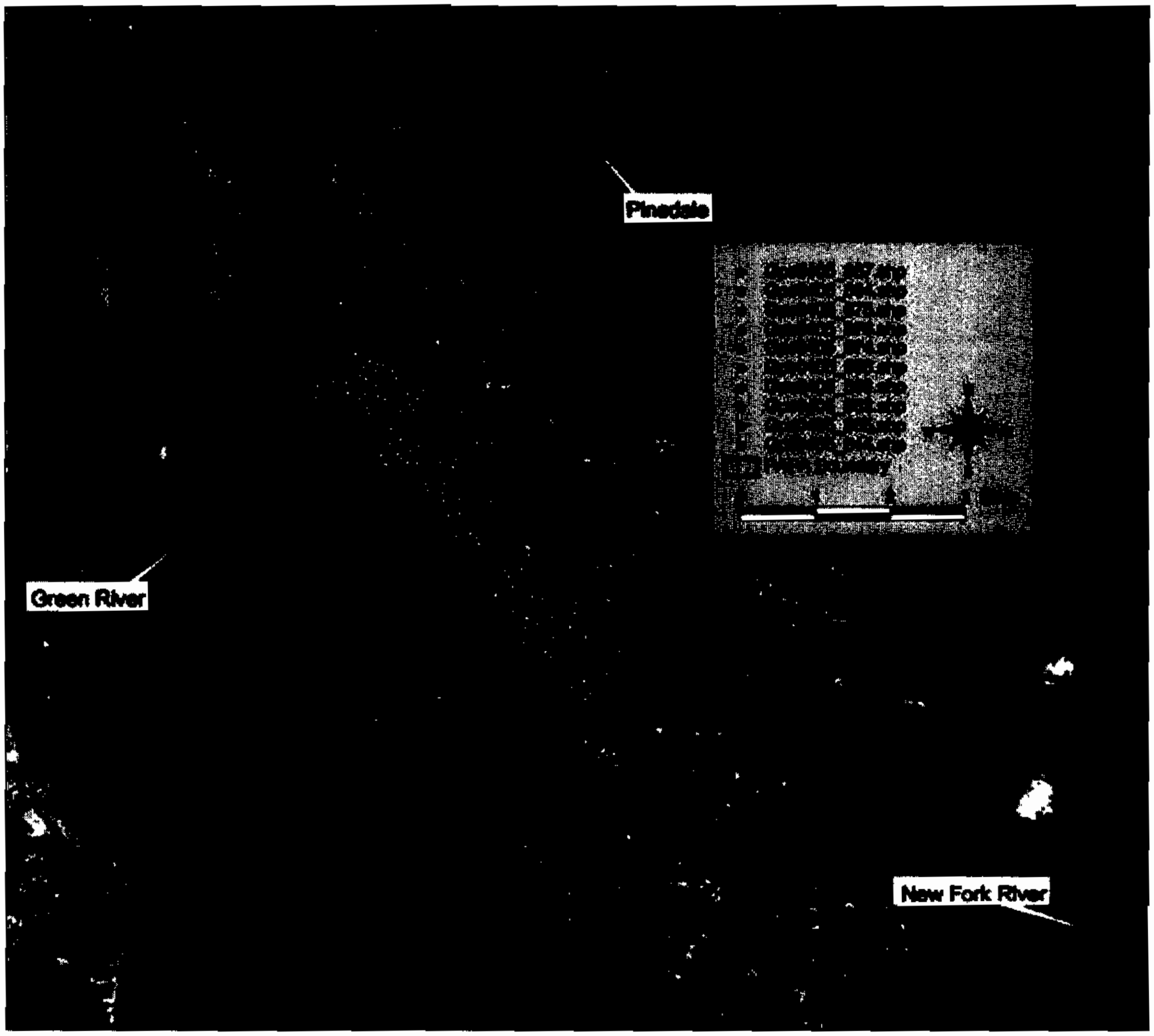

Figure 2.4. GPS locations (r = 15,974) collected from 10 deer on the Pinedale Anticline Project Area (PAPA), November 1, 2004 – April 15, 2005, overlaid on satellite image taken August 28, 2004.

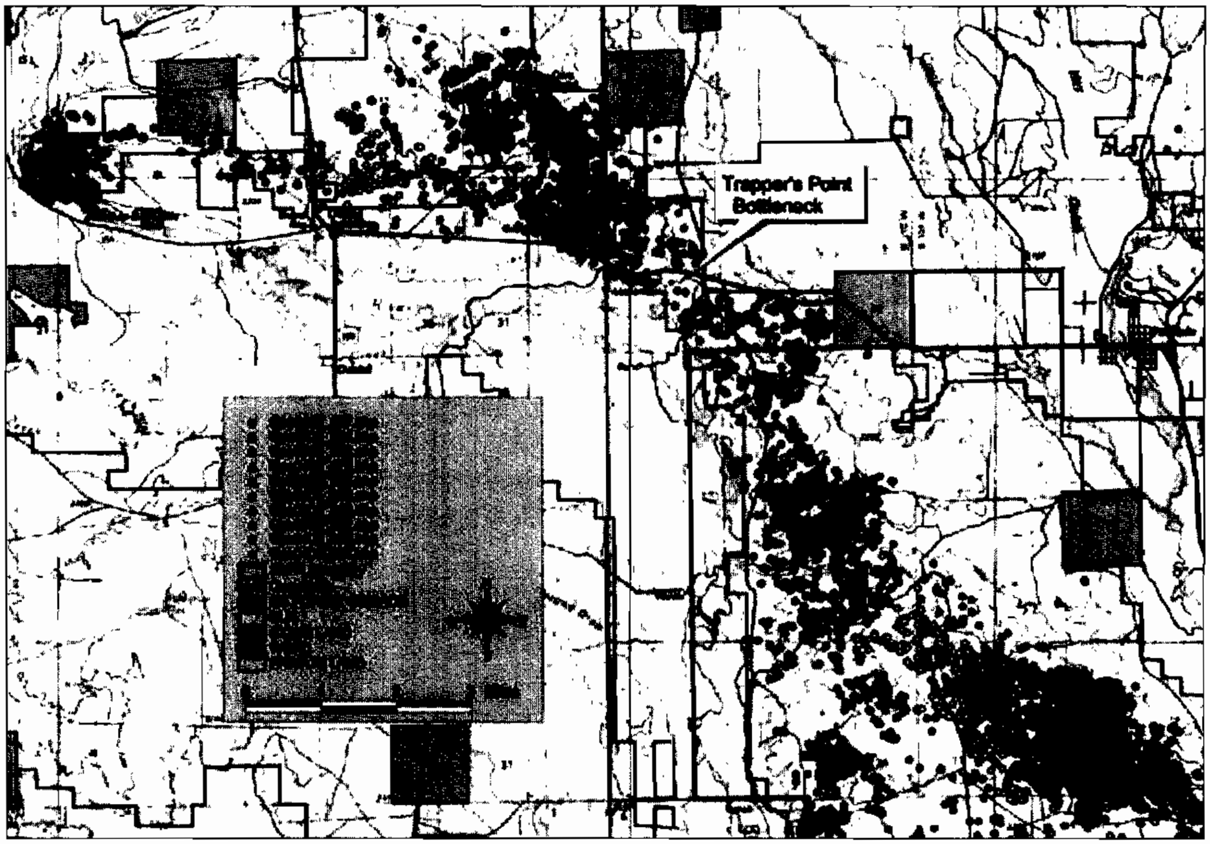

Figure 2.5. Distribution of land ownership and GPS locations collected from 10 deer on the Pinedale Anticline Project Area (PAPA), November 1, 2004 – April 15, 2005.

Several unusual movement events were documented from GPS collars recovered this spring. First, was Deer #862 (Figure 2.6) that was captured on the Mesa on December 18, 2003. Deer #862 moved around the Mesa for 3 weeks after capture, then left the project area and migrated 20-25 miles southwest. This deer spent the remaining winter months in a different winter range characterized by sagebrush draws and located near the Calpet Road, south of Big Piney. In the spring of 2004 this deer used the same migration route to move back through the western edge of the Mesa, through the TPB, and onto summer ranges. This deer returned in the fall of 2004 through the TPB, but did not move into the central portion of the Mesa, rather it moved quickly down the western edge and returned to the Big Piney winter range via the migration route it used the year before. Interestingly, in the spring of 2005, this deer used a different migration route between Big Piney and the Mesa. Deer #862 was the first GPS-collared deer to have left the Mesa and on moved on to a different winter range.

The second unusual movement was that of Deer #887 (Figure 2.7), captured on the Mesa on December 18, 2003. Deer #887 occupied the western breaks of the Mesa during the 2003-04 winter and migrated through the TPB in the spring of 2004 on its way to summer range. However, in the fall of 2004, this deer returned to the Mesa via the typical Pinedale Front migration route that runs along the base of the Wind River Range. And then in the spring of 2005, Deer #887 again migrated off the Mesa through the TPB. Of all the GPS-collared deer (>50) we've monitored on the Mesa in the last 5 years, Deer #887 was the first to and from summer ranges using both Trapper's Point and the Pinedale Front migration routes.

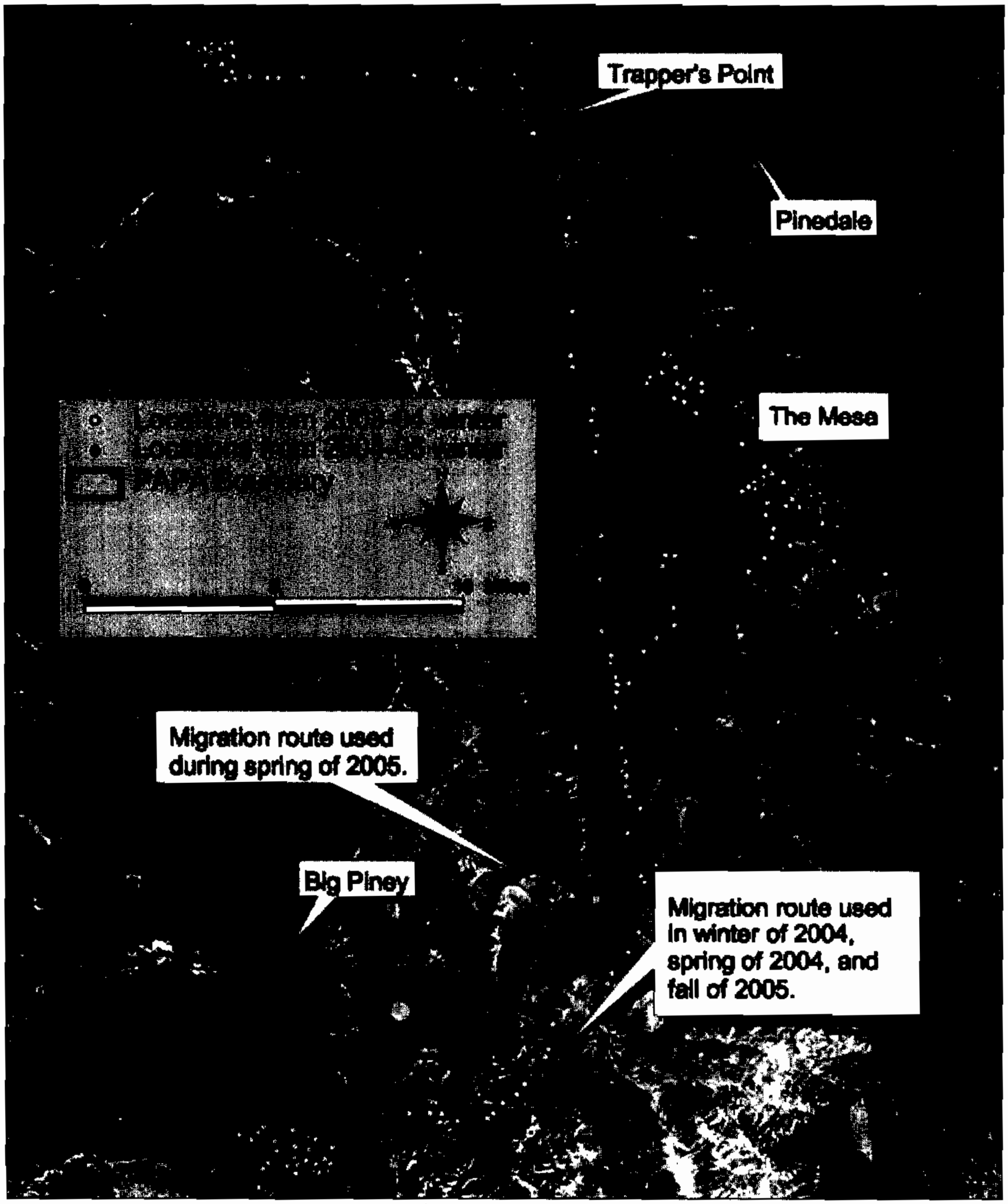

Figure 2.6 GPS locations (r = 2,253) of deer #862 in the Pinedale Anticline Project Area (PAPA), December 18, 2003 – April 15, 2004 (yellow) and November 1, 2004 – April 15, 2005 (blue).

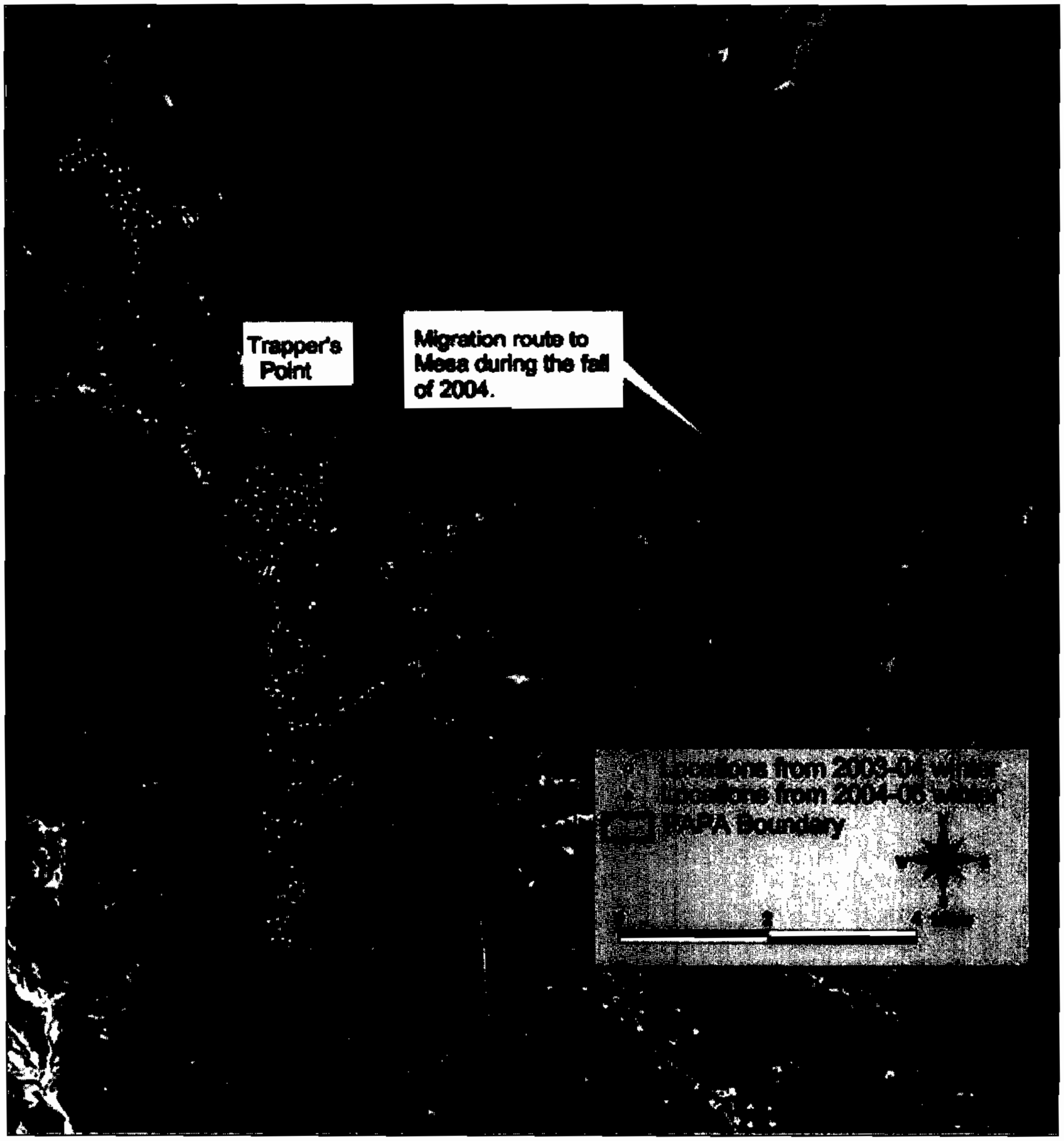

Figure 2.7 GPS locations (r = 2,368) of deer #887 in the Pinedale Anticline Project Area (PAPA), December 21, 2003 – April 15, 2004 (yellow) and November 1, 2004 – April 15, 2005 (blue).

<u>2.4.3.2 Control Area (Pinedale Front):</u>

We mapped GPS locations collected from 7 deer that used the Pinedale Front during the 2004-05 winter (Figure 2.8). Data from 3 additional deer were not mapped because their collars will not be recovered until April 15, 2006.

Consistent among deer was their mobility and tendency to shift areas of use through the winter, utilizing areas that exceeded 100-mi^2. And, similar to previous years (Sawyer et al. 2004), deer moved outside the core winter range area around Buckskin Crossing to peripheral areas, such as Elk Mountain, Little Sandy Creek, and areas along the west side of the Prospects. While distribution patterns of deer were variable across the winter range, the migratory routes to and from the winter range were nearly identical among deer (Figure 2.9).

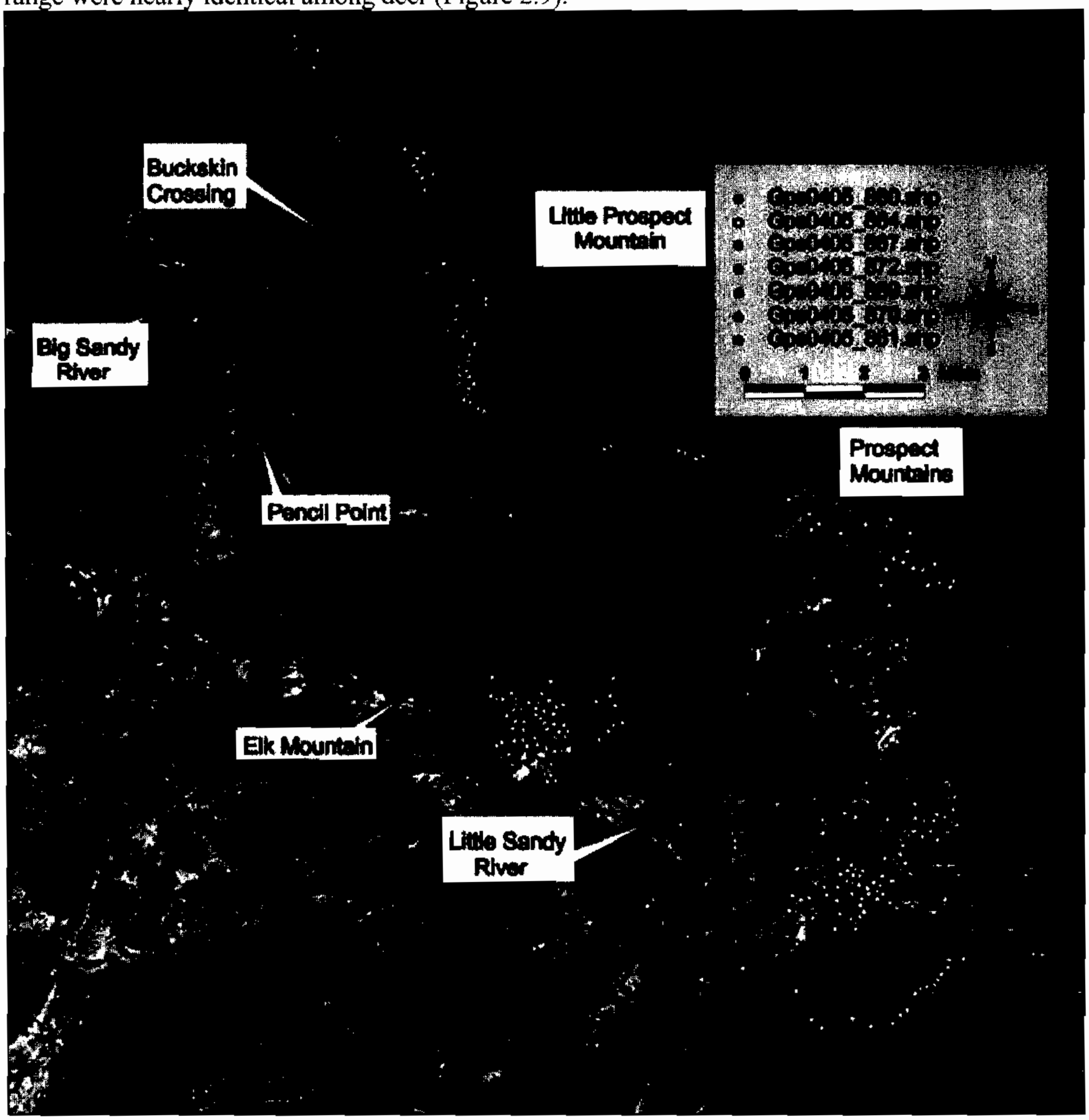

Figure 2.8. GPS locations (r = 8,695) collected from 7 deer on the Pinedale Front Winter Range Complex (PFWRC), November 1, 2004 – April 15, 2005.

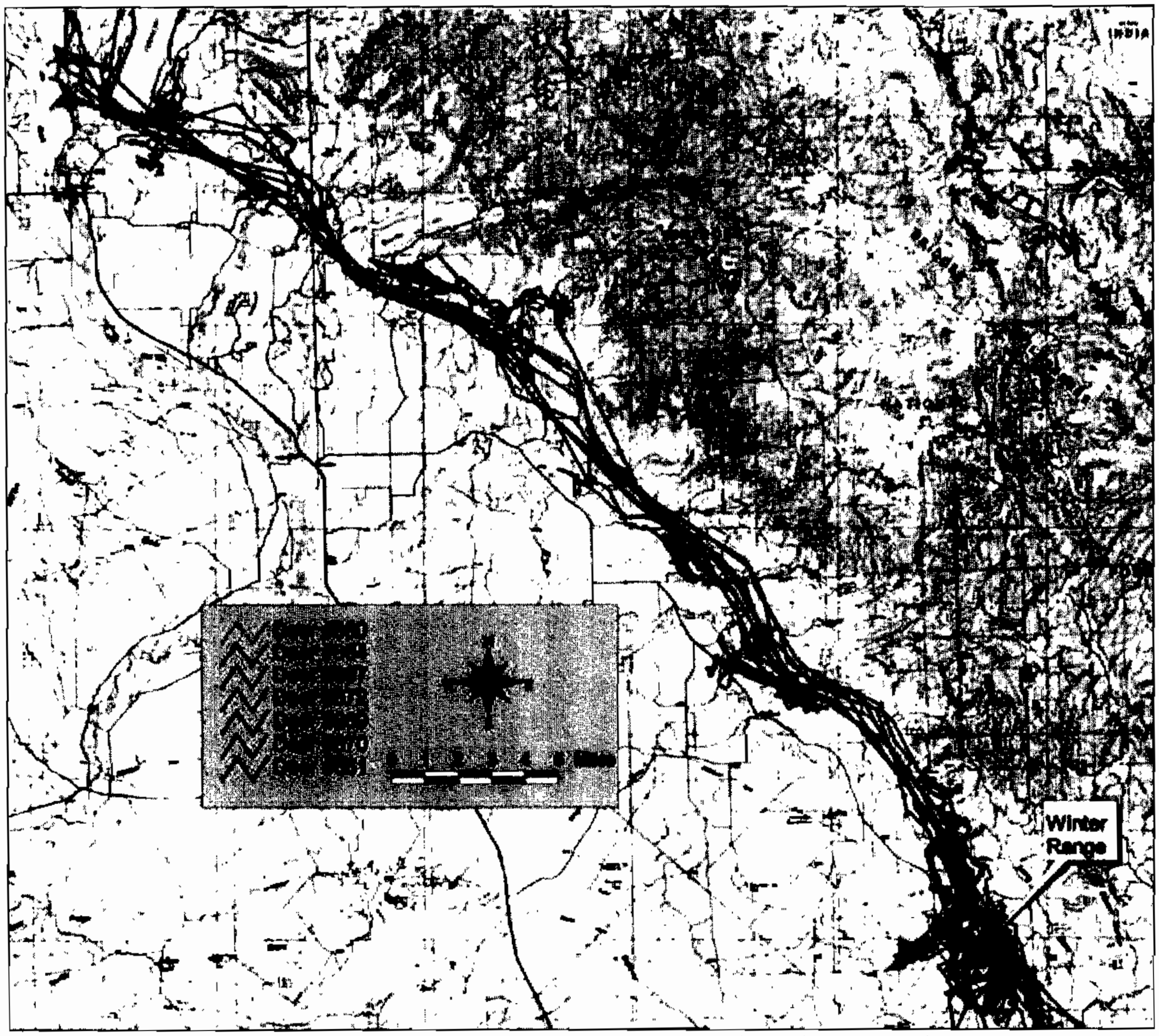

Figure 2.9. Migration routes from 7 GPS-collared deer on the Pinedale Front Winter Range Complex (PFWRC), November 1, 2004 – April 15, 2005.

Most deer began migrating north along the Pinedale Front in mid-March. Deer that winter along the Pinedale Front were known to migrate northerly along the Wind River Range to the New Fork Lake area before shifting their migration in a westerly route towards the Hoback Basin and adjacent mountain ranges (Sawyer and Lindzey 2001). Details of this migration route, in terms of size, width, specific location, and deer fidelity were unknown prior to GPS data collected over the last 3 years. Consistent with the last 2 years, all 7 GPS-collared deer migrated along a distinct 50-mile movement corridor located at the base of the Wind River Range. While deer sometimes remained in one area for a number of days, they appeared to follow a well-defined route that narrowed to ¼-mile in some areas (i.e., Boulder Lake, Fremont Lake), but rarely exceeded 1-2 miles in width (Figure 2.9).

The migration route leads deer north from the Buckskin Crossing area, across the Big Sandy River, then northerly across the sagebrush flats below Sheep Creek and Muddy Creek. Deer then moved into slightly rougher terrain among the boulders and sagebrush draws east of CR 353,

south of the East Fork, and west of Irish Canyon. Deer then moved northerly, crossing the East Fork and Pocket Creek approximately 2-3 miles east of CR 353. Once across Pocket Creek, deer contoured through the sagebrush slopes and aspen pockets, northerly through Cottonwood Creek and Silver Creek. From Silver Creek, deer continued northwesterly across Lovett and Scab Creek. Deer continued to contour across the sagebrush slopes below Soda Lake, towards the outlet of Boulder Lake. Deer crossed Boulder Creek near the outlet of Boulder Lake, and then moved north to Fall Creek, apparently to avoid an agricultural area between Fall Creek and Pole Creek. Deer crossed Fall Creek just below the confluence of Meadow Creek, and then moved northwesterly toward the outlet of Fremont Lake. Deer crossed Pine Creek at the Fremont Lake Bottleneck, as described by Sawyer and Lindzey (2001), and continued north along the Willow Creek Road and Fremont Ridge. Deer moved within ½-mile either side of the Willow Lake Road from Soda Lake to the outlet of Willow Lake.

2.4.4 Population Characteristics

2.4.4.1 Abundance and Density Estimates

Helicopter flights were conducted on February 23-24, 2005 to count deer in selected 1-mi^2 quadrats of both treatment and control areas. Average flight time per quadrat was 10 minutes. Estimated deer abundance ($\hat{N}$) in the treatment area was 2,818 ± 536 and deer density ($\hat{D}$) was 41 ± 8 deer/mi^2 (Table 2.2, Figure 2.10). Deer abundance and density in the treatment area were lower than previous years. Estimated deer abundance ($\hat{N}$) in the control area was 4,281 ± 723 and deer density ($\hat{D}$) was 61 ± 10 deer/mi^2 (Table 2.3, Figure 2.11). Abundance and density estimates for the control area were significantly higher than last year, but have been variable since 2002. Because the sampling frame in the control area did not reflect the area utilized by our marked population prior to 2004, abundance and density estimates are expected to be biased high during 2002 and biased low during 2003.

We used the abundance estimates from 2002 through 2005 to fit weighted least-squares regression lines (Figures 2.10 and 2.11) and test whether or not the lines (i.e., trend) had slopes that differed from zero. The regression equation for the treatment area was: Y = 5335 – 845(yr[a]). The line from this equation had an R^2 of 98.5% and a slope that was significantly different from zero (t = -12.67, P = 0.006), indicating a declining deer population through the course of study. The negative slope and associated coefficient indicates deer abundance decreased at an average rate of 845 animals per year between 2002 and 2005, resulting in a 4-year 46% reduction. The regression equation for the control area was: Y = 1685 + 582(yr). The line from this equation had an R^2 of 26.6% and a slope that was not significantly different from zero (t = 0.85, P = 0.484), indicating that the estimated positive trend was not statistically significant. A comparative test between the trend lines from the control and treatment areas, indicated the trends (i.e., slopes) were not statistically different at a 90% confidence level (t = -1.989, P = 0.117, df =4), but would be considered different at a confidence level ≤ 88%.

[a] yr = year of study (i.e., 0, 1, 2, 3)

Table 2.2 Summary statistics for abundance and density estimates in the treatment area, February 2002 - 2005.

Summary Statistics	Treatment Area (The Mesa)			
Year	***2002***	***2003***	***2004***	***2005***
Total Quadrats (U)	68	66	68	68
Quadrats Sampled (u)	18	32	34	34
Deer Counted (N)	1,384	2,267	1,782	1,409
Density Estimate ($\hat{D}$)	***77***	***71***	***52***	***41***
Variance ($V\hat{a}r(\hat{D})$)	146	87	34	23
Standard Error ($SE(\hat{D})$)	12.07	9.30	5.82	4.79
90% Confidence Interval	(57, 97)	(56, 86)	(42, 62)	(33, 49)
Abundance Estimate($\hat{N}$)	***5,228***	***4,676***	***3,564***	***2,818***
Variance ($V\hat{a}r(\hat{N})$)	673863	377132	156318	106246
Standard Error ($SE(\hat{N})$)	821	614	395	326
90% Confidence Interval	(3,878 - 6,578)	(3,666 - 5,686)	(2,914 - 4,214)	(2,282 - 3,354)
Coefficient of Variation ($CV(\hat{N})$)	16%	13%	11%	12%

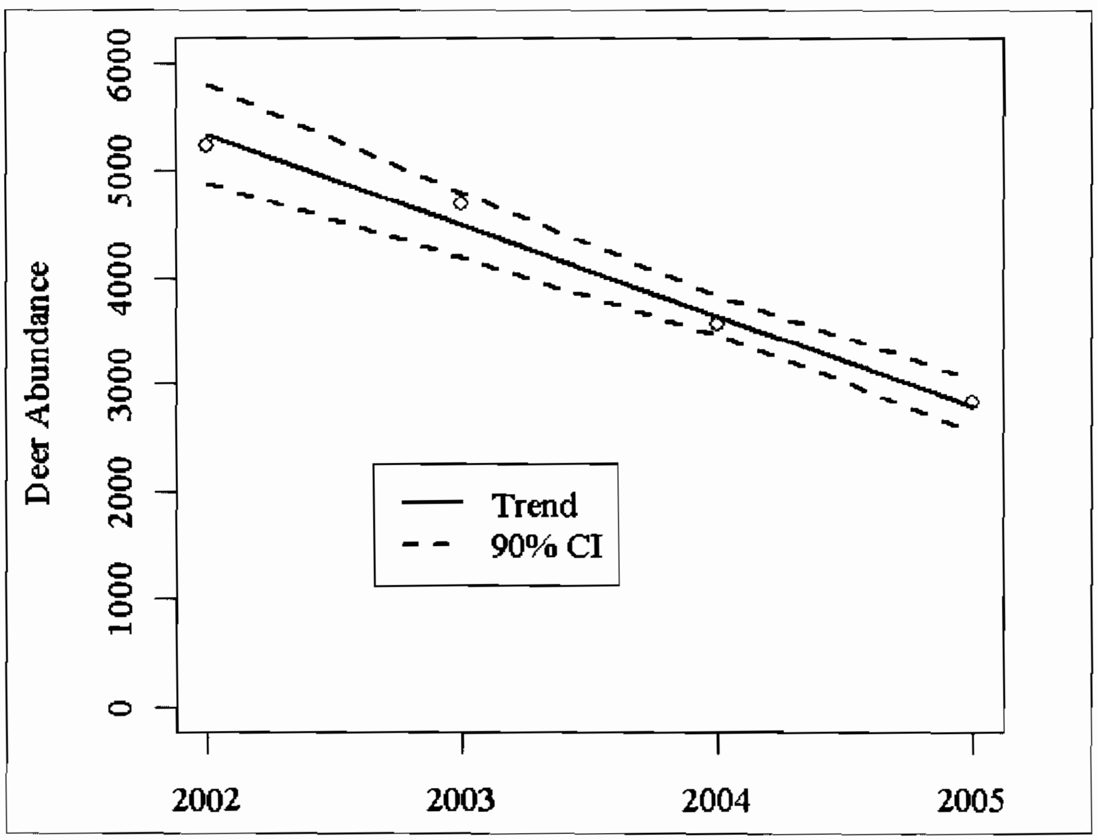

Figure 2.10. Regression plot and 90% confidence intervals of deer abundance in treatment area (Mesa), February 2002 – 2005.

Table 2.3 Summary statistics for abundance and density estimates in the control area, February 2002 - 2005.

Summary Statistics	Control Area (Pinedale Front)			
Year	*2002*[a]	*2003*[b]	*2004*	*2005*
Total Quadrats (U)	35	38	70	70
Quadrats Sampled (u)	7	18	34	33
Deer Counted (N)	810	849	1,171	2,018
Density Estimate ($\hat{D}$)	***116***	***47***	***34***	***61***
Variance ($V\hat{a}r(\hat{D})$)	406	64	22	39
Standard Error ($SE(\hat{D})$)	20.14	8.01	4.70	6.28
90% Confidence Interval	(83, 149)	(31, 63)	(26, 42)	(51, 71)
Abundanee Estimate($\hat{N}$)	***4,050***	***1,792***	***2,411***	***4,281***
Variance ($V\hat{a}r(\hat{N})$)	496,752	92,661	108,347	193,294
Standard Error ($SE(\hat{N})$)	705	304	329	440
90% Confidence Interval	(2,891 - 5,209)	(1,291 - 2,293)	(1,870 - 2,952)	(3,558 - 5,004)
Coeffieient of Variation ($CV(\hat{N})$)	17%	17%	14%	10%

[a] Abundance and density estimates expected to be high.
[b] Abundance and density estimates expected to be low.

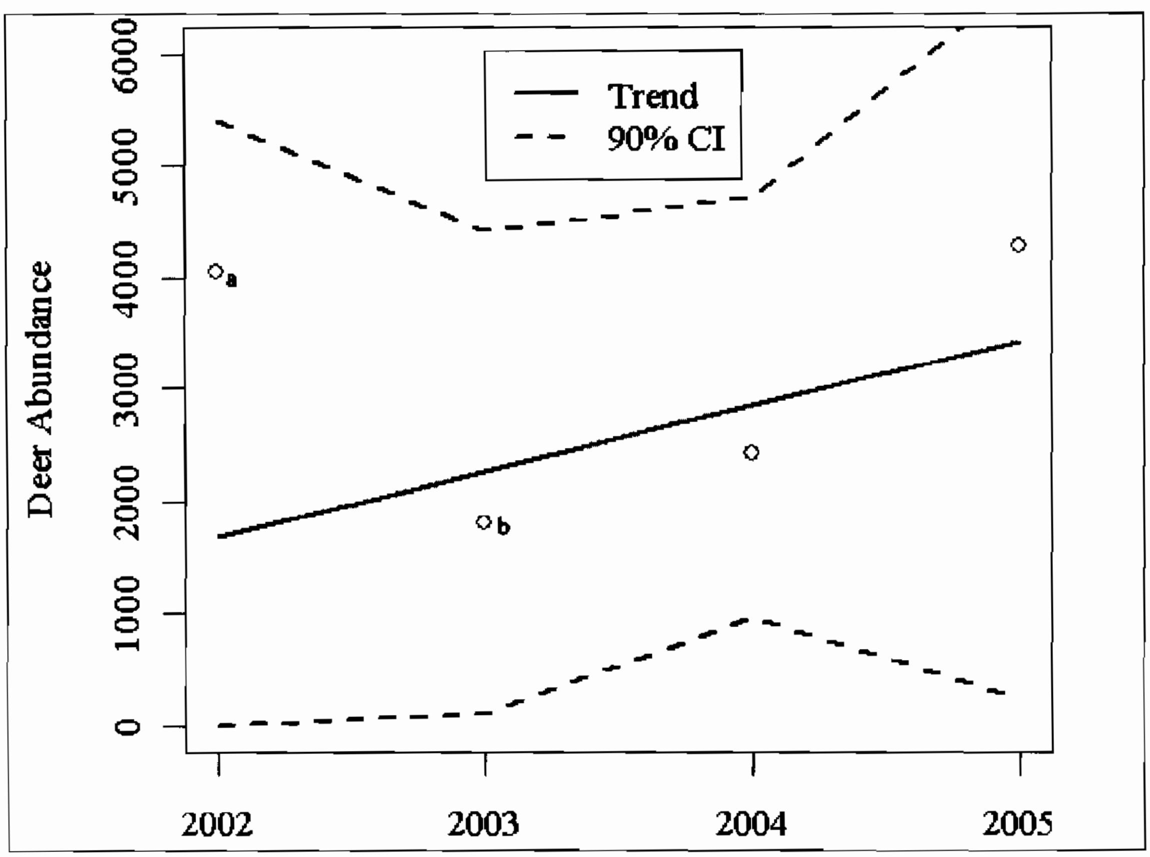

Figure 2.11. Regression plot and 90% confidence intervals of deer abundance in control area (Pinedale Front), February 2002 – 2005.

2.4.4.2 Reproduction

Year	Treatment fawn:doe December	Control fawn:doe December
Pre-Development Phase		
1992-93	62	61
1993-94	47	51
1994-95	61	72
1995-96	56	63
1996-97	73	75
1997-98	92	81
1998-99	67	76
1999-00	85	76
Average	**68**	**69**
Development Phase		
2000-01	85	81
2001-02	69	71
2002-03	64	65
2003-04	78	78
2004-05	68	69
Average	**73**	**73**

The WGFD conducted helicopter composition (buck:doe:fawn) surveys to collect pre-winter (December) information on the sex (i.e., buck or doe) and age (i.e., fawn or adult) structure of the population. A total of 8,622 deer were classified in December of 2004, including 3,345 on the Mesa Winter Range Complex and 5,277 on the Pinedale Front Winter Range Complex (S. Smith, WGFD, unpublished data). Estimated fawn:doe ratios were 68:100 for the Mesa and 69:100 in the Pinedale Front (Table 2.4). Both areas have displayed similar trends in reproduction (fawn:doe ratios) prior to and since the PAPA ROD in 2000 (Figure 2.12).

Table 2.4 (Left)
Mule deer fawn:doe ratios measured for treatment (Mesa) and control (Pinedale Front) areas by Wyoming Game and Fish Department, 1992-2005.

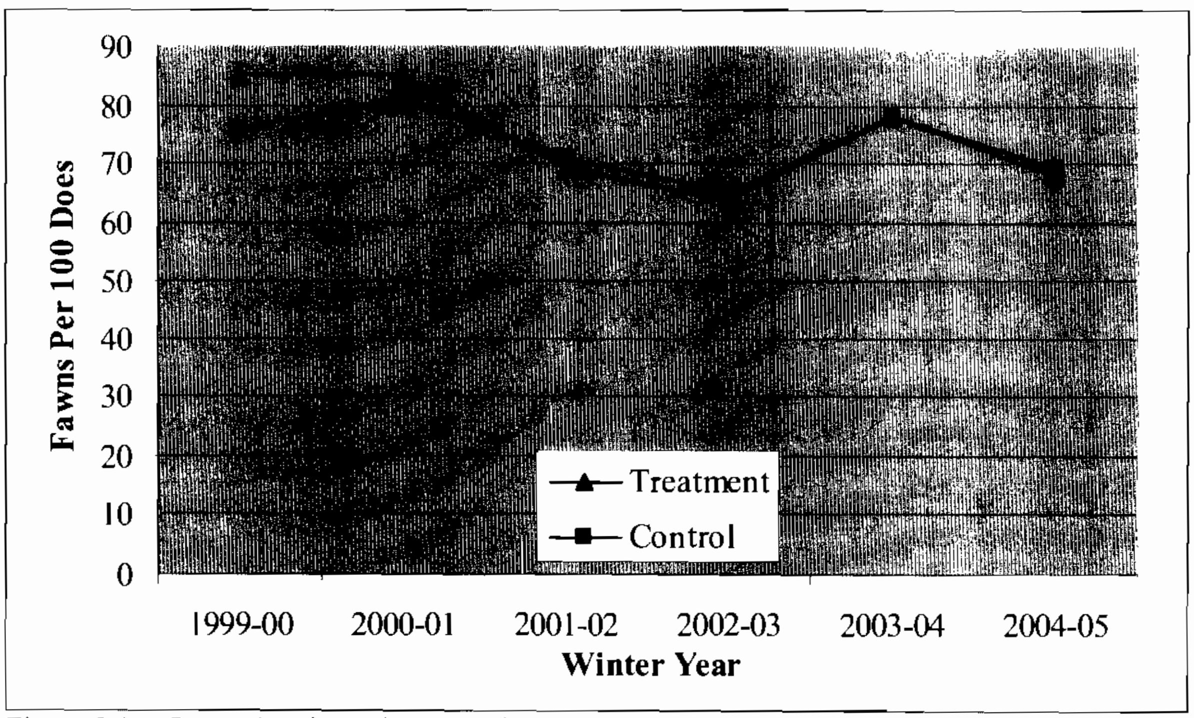

Figure 2.12 December fawn:doe ratios in treatment and control areas, 1999-2005.

2.4.4.3 Over-winter Fawn Survival

The WGFD conducted ground-based composition (adult:fawn) surveys to estimate post-winter fawn:adult ratios during April of 2005 (S. Smith, WGFD, unpublished data). A total of 2,252 and 2,024 deer were counted in the Pinedale Front and Mesa winter ranges, respectively (Tables 2.5-2.6). Estimates of over-winter fawn survival were 0.79 and 0.64 in the Pinedale Front and Mesa, respectively (Tables 2.5-2.6). Except for the relatively severe 2003-04 winter (Photo 2.1), over-winter fawn survival has generally been lower in the treatment area (Mesa) compared to the control (Pinedale Front), since the PAPA ROD in 2000 (Figure 2.13).

Table 2.5 Mule deer count data and calculations for over-winter fawn survival in the control (Pinedale Front), 1999-2005.

Year	December Adults	December Fawns	April Adults	April Fawns	*A**	*B***	$\hat{S}_a$	$\hat{S}_f$
1999-00	2,698	1,517	959	494	0.56	0.52	0.83	0.76
2000-01	2,853	1,769	955	478	0.62	0.50	0.85	0.69
2001-02	4,593	2,455	790	300	0.53	0.38	0.85	0.60
2002-03	3,565	1,813	704	254	0.51	0.36	0.96	0.68
2003-04	3,977	2,463	1771	441	0.62	0.25	0.82	0.33
2004-05	3,394	1,883	1565	687	0.55	0.44	1.0	0.79

* *A* = count of December fawns/count of December adults

** *B* = count of April fawns/count of April adults

Table 2.6 Mule deer count data and calculations for over-winter fawn survival in the treatment (Mesa), 1999-2005.

Year	December Adults	December Fawns	April Adults	April Fawns	*A*	*B*	$\hat{S}_a$	$\hat{S}_f$
1999-00	2,550	1,547	1,390	764	0.61	0.55	0.82	0.74
2000-01	2,420	1,458	1,685	707	0.60	0.42	0.85	0.59
2001-02	2,546	1,275	1,366	460	0.50	0.34	0.85	0.57
2002-03	1,864	914	1,489	470	0.49	0.32	0.88	0.57
2003-04	2,063	1,201	1,215	319	0.58	0.26	0.79	0.36
2004-05	2,162	1,183	1,477	547	0.55	0.37	0.95	0.64

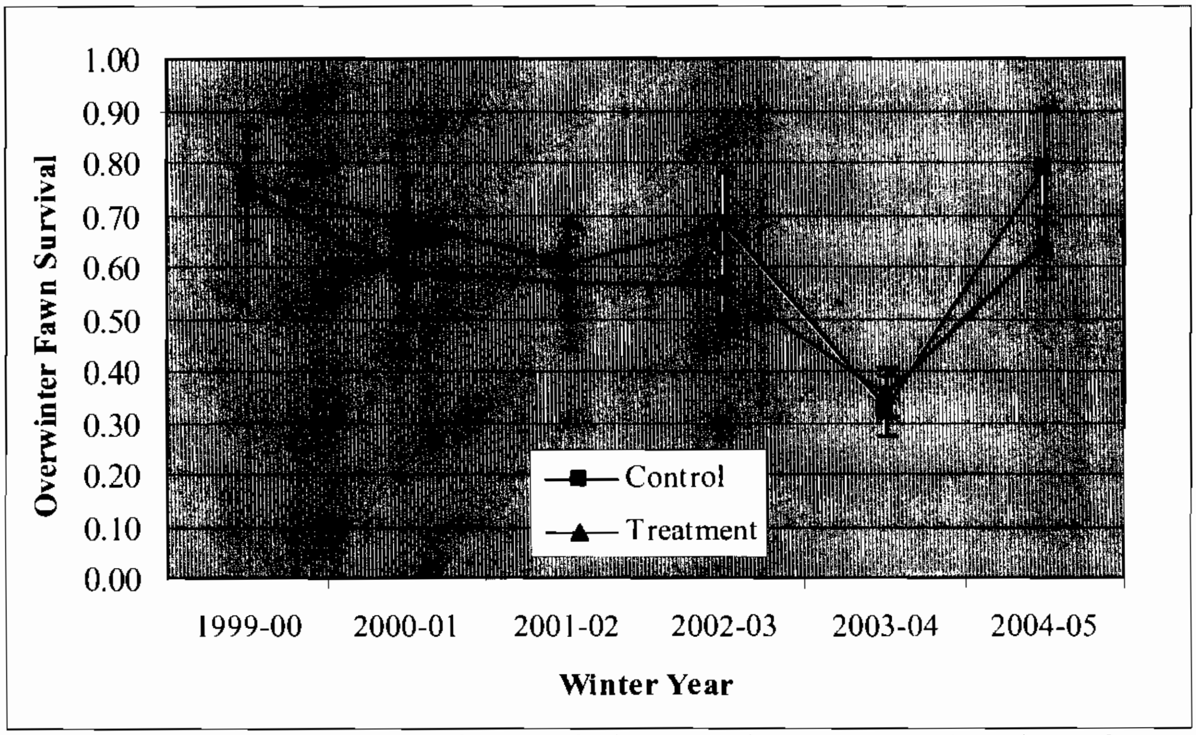

Figure 2.13 Estimated over-winter fawn survival and associated 90% confidence bands for treatment and control areas, 1999-2005.

2.4.4.4 Adult Winter Survival

Winter (December 15 – April 15) survival rates were estimated using the telemetry records of 67 radio-collared adult female deer, including 45 in the treatment and 22 in the control area. Two radiocollared deer (#874, #505) died in the treatment and none in the control. Both deer that died in the treatment were in poor body condition and starvation appeared to be the cause of death. Winter survival rates were 0.95 and 1.00 for the treatment and control areas, respectively (Table 2.7, Figure 2.14). It is worth noting that one deer (#804) from the control died in early November 2004, however she was not included in this survival analysis because her death occurred outside the December 15 – April 15 period that we used to estimate winter survival. Because standard methods cannot be used to compute a standard error or confidence interval for a proportion equal to 1.0, we used a one-sided binomial hypothesis test (Lehmann 1986:93) to estimate the standard error in Table 2.5. The estimated standard error (0.07) is larger than estimates from previous years and should be considered conservative. The high adult survival rates corresponded with a relatively mild winter, compared with 2003-04 (Photos 2.1 and 2.2).

Table 2.7 Winter (2004-05) survival rates and summary statistics for adult female radio-collared deer in treatment and control areas.

Study Area	[illegible]	N_1	N_2	$\hat{S}$	90% CI	SE
Pinedale Anticline (Treatment)	December 15, 2004 - April 15, 2005	45	2	0.95	0.91 to 0.99	0.03
Pinedale Front (Control)	December 15, 2004 - April 15, 2005	22	0	1.0	0.91 to 1.0	0.07

N_1=number of available collars, N_2=number of deaths, $\hat{S}$ =survival estimate, CI=confidence interval

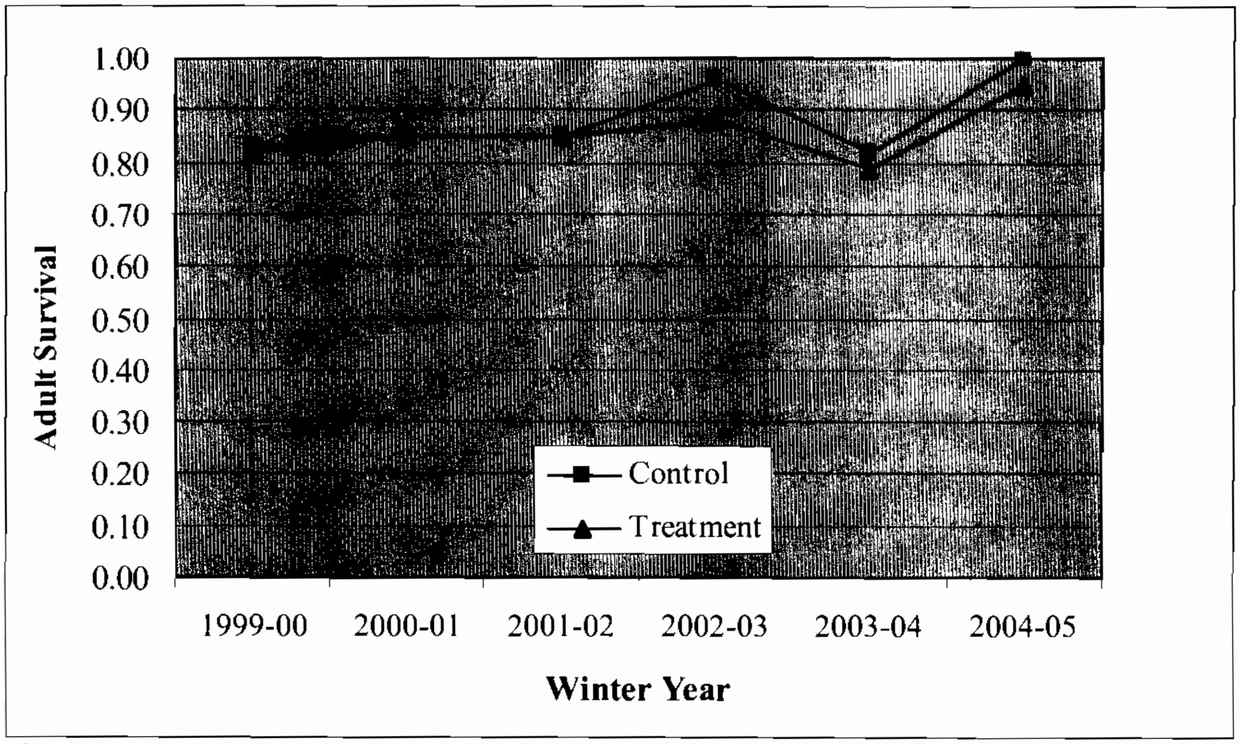

Figure 2.14 Winter survival rates of adult female radio-collared deer in treatment and control areas, 1999-2005.

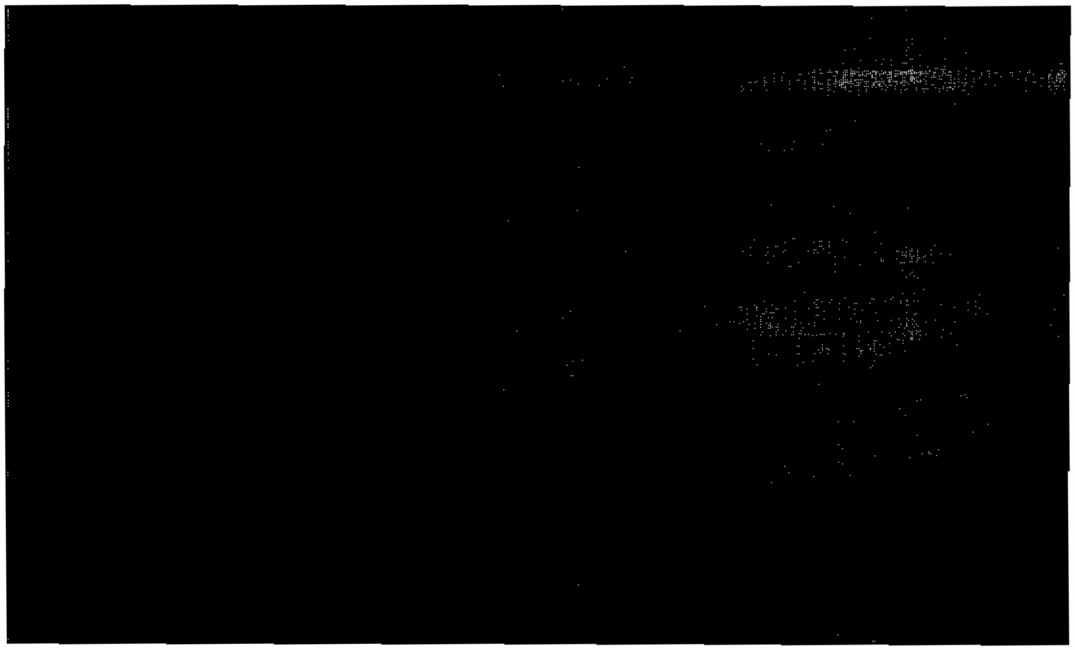

Photo 2.1 Snow conditions on Mesa during February 2004 (view south towards Two Buttes).

Photo 2.2. Snow conditions on Mesa during February 2005 (view south towards Two Buttes).

2.4.5 Direct Habitat Loss

2.4.5.1 Pre-Development

Prior to development, The Mesa portion of the PAPA was relatively undisturbed, with very few improved roads and approximately a dozen existing well pads (Figure 2.15).

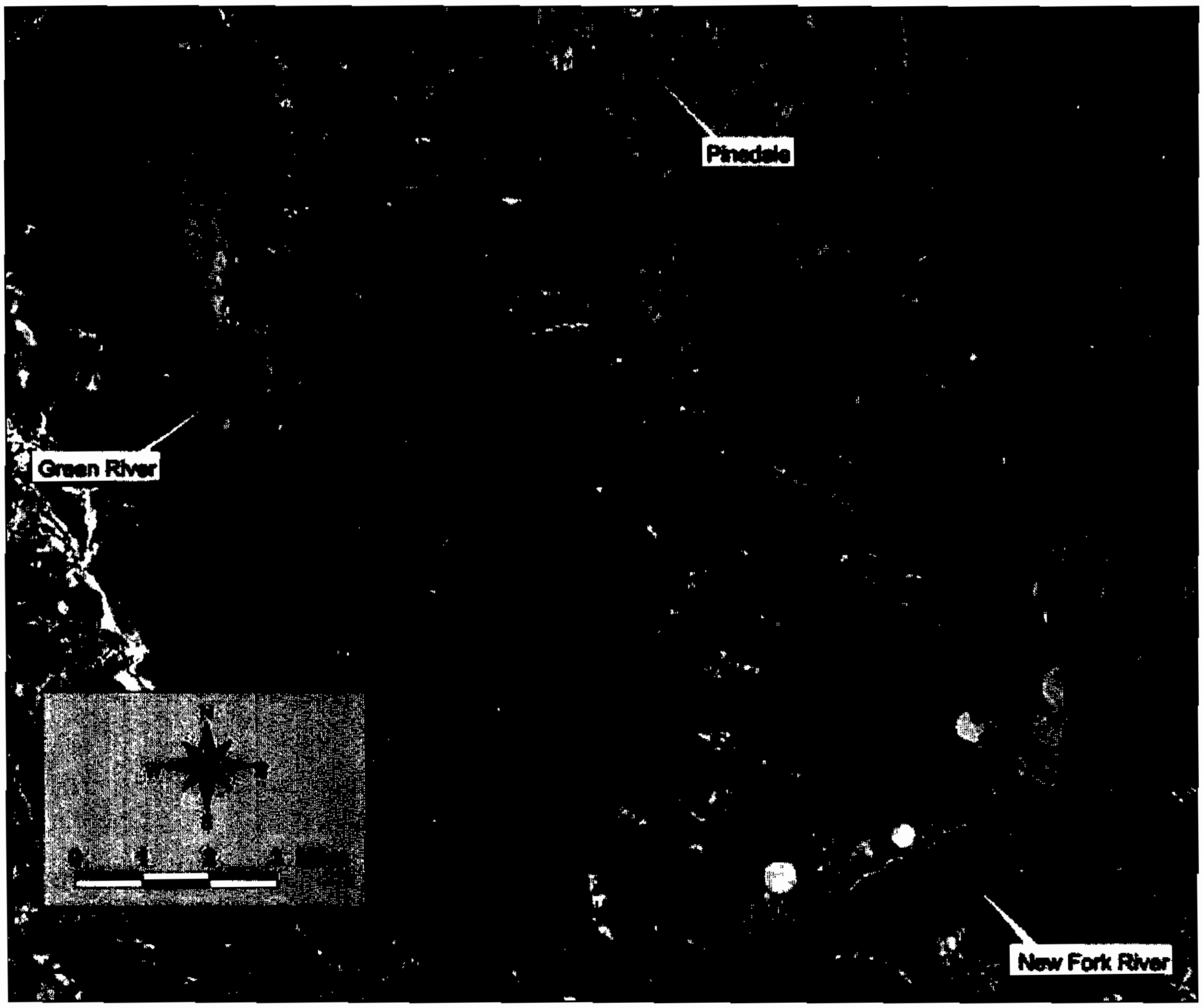

Figure 2.15 Satellite image of the Mesa on October 1999, prior to development of the Pinedale Anticline Project Area (PAPA).

2.4.5.2 Year 1 of Development

The BLM's ROD for the PAPA was released in July, 2000. Accordingly, natural gas development was minimal during this year. Approximately 11 miles of new roads and 39 acres of well pads were constructed on the Mesa during 2000 (Table 2.8). Approximately 51% of total surface disturbance was associated with road building, while the other 49% was attributed to well pad construction (Table 2.8).

2.4.5.3 Year 2 of Development

2001 marked the first full calendar year of gas field development in the PAPA. Most development occurred along the central portion of the Mesa, adjacent to Lovatt Draw (Figure 2.16). Based on satellite imagery, approximately 13 miles of new roads and 113 acres of well pads were constructed on the Mesa during the first nine months 2001 (Table 2.8). Approximately 30% of total surface disturbance was associated with road building, while the other 70% was attributed to well pad construction (Table 2.8).

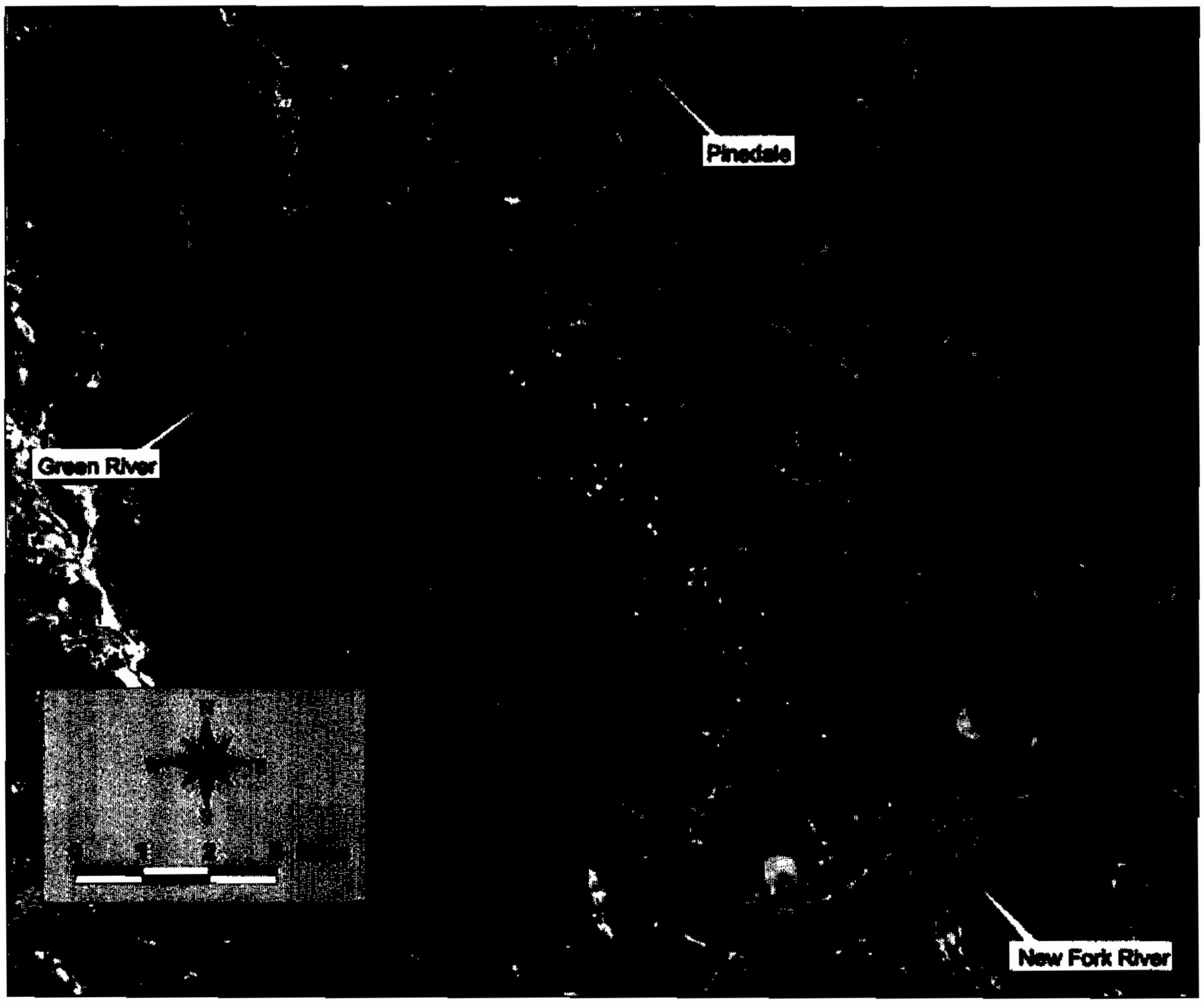

Figure 2.16 Satellite image taken in August 2001 during Year 2 of gas development in the Pinedale Anticline Project Area (PAPA).

2.4.5.4 Year 3 of Development

Similar to 2001, most development in 2002 occurred along the central portion of the Mesa, adjacent to Lovatt Draw, from the Paradise Road northwest to Stewart Point (Figure 2.17). Drilling activity was also evident on the northern Mesa, east of Stewart Point. Based on satellite imagery, approximately 18 miles of new roads and 201 acres of well pads were constructed on the Mesa between August 2001 and October 2002 (Table 2.8). Approximately 25% of total surface disturbance was associated with road building, while the other 75% was attributed to well pad construction (Table 2.8).

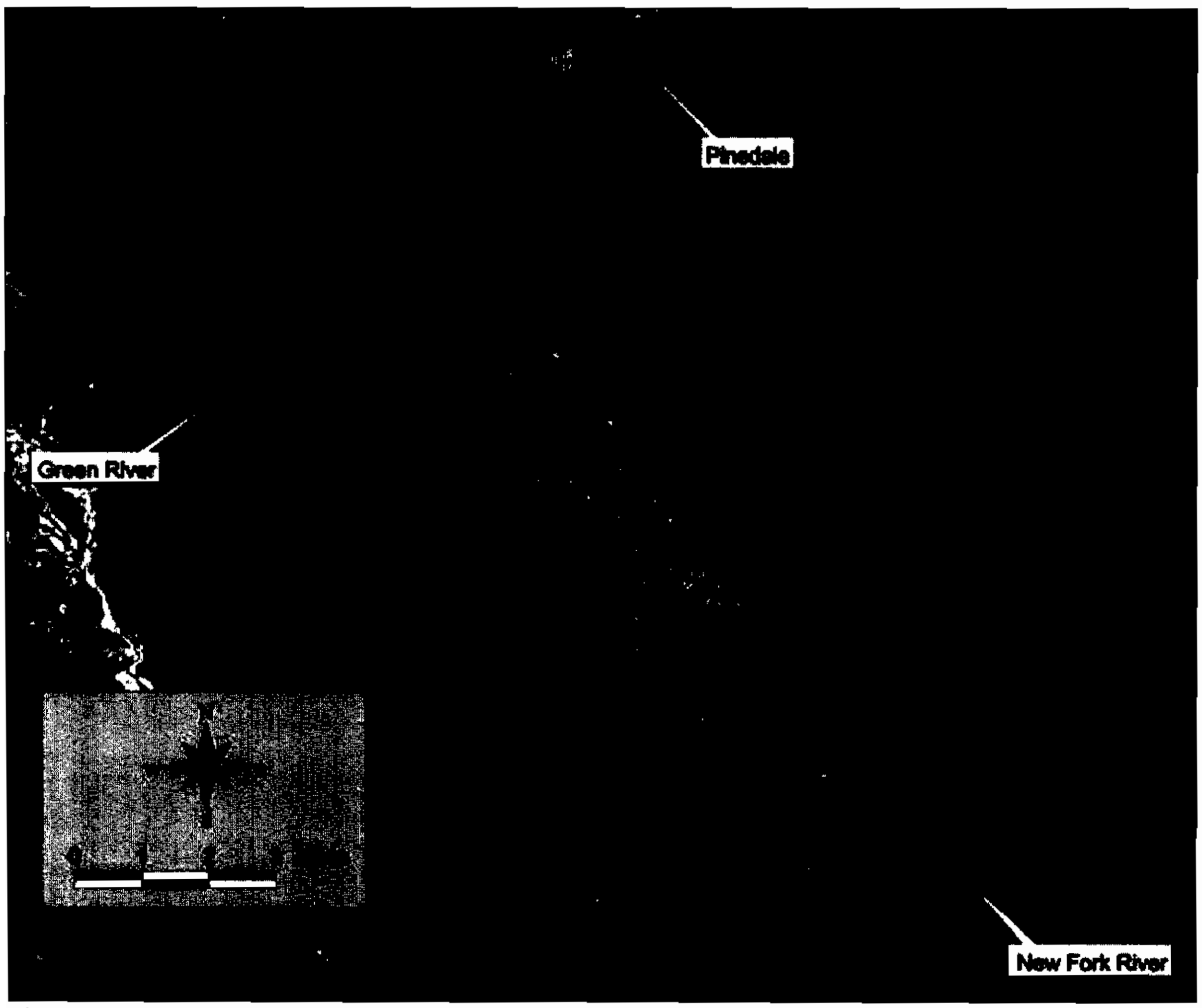

Figure 2.17 Satellite image taken in October 2002 during Year 3 of gas development in the Pinedale Anticline Project Area (PAPA).

2.4.5.5 Year 4 of Development

Similar to 2001 and 2002, most gas development in 2003 occurred along the central portion of the Mesa, adjacent to Lovatt Draw, from the Paradise Road northwest to Stewart Point (Figure 2.18). Drilling activity was also evident on the northern Mesa, east of Stewart Point. Based on satellite imagery, approximately 14 miles of new roads and 237 acres of well pads were constructed on the Mesa between October 2002 and September 2003 (Table 2.8). Approximately 18% of total surface disturbance was associated with road building, while the other 82% was attributed to well pad construction (Table 2.8).

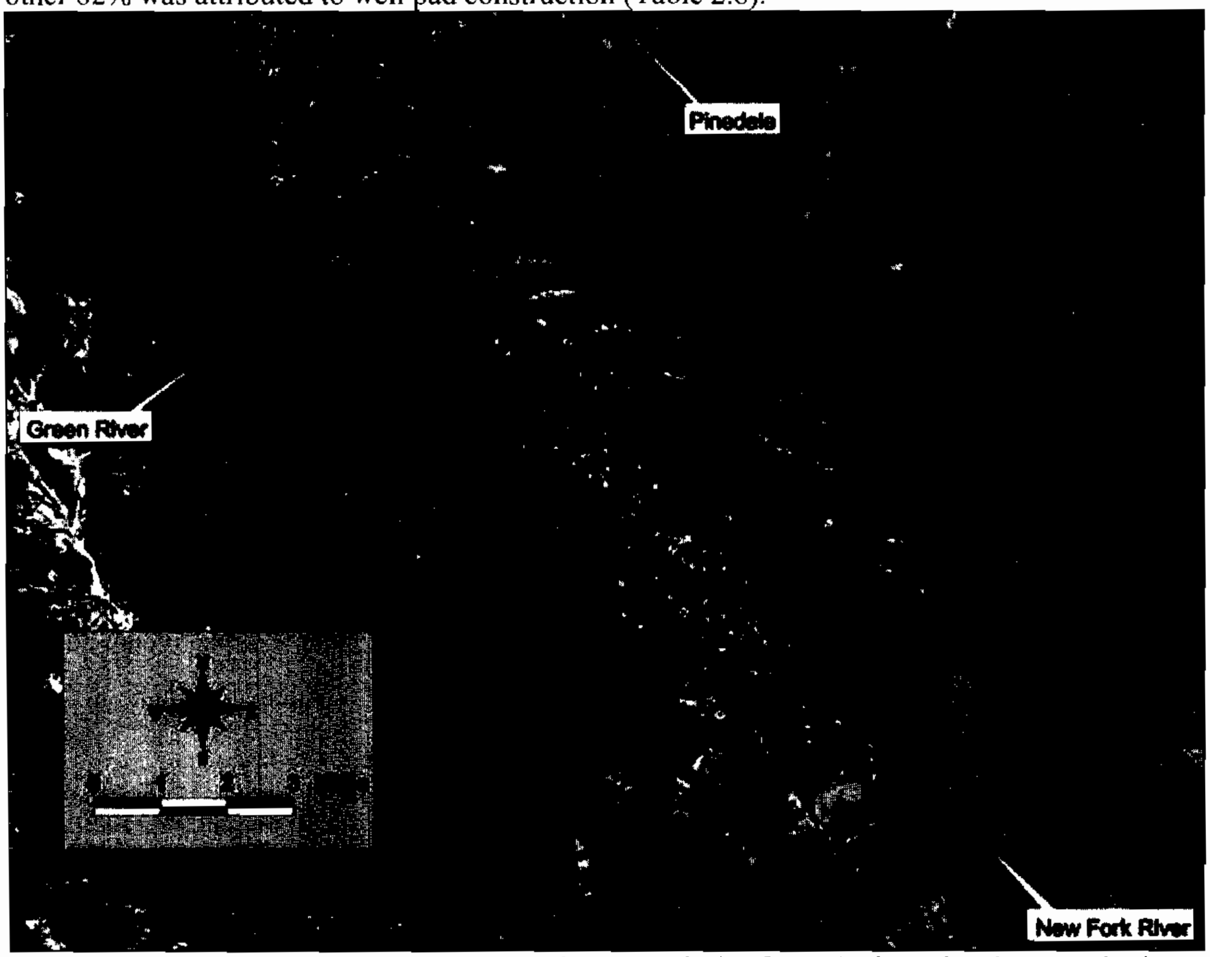

Figure 2.18 Satellite image taken in September 2003 during Year 4 of gas development in the Pinedale Anticline Project Area (PAPA).

2.4.5.5 Year 5 of Development

Similar to 2001-2003, most gas development in 2004 occurred along the central portion of the Mesa, adjacent to Lovatt Draw, from the Paradise Road northwest to Stewart Point (Figure 2.19). Drilling activity was also evident on the northern Mesa, east of Stewart Point. Based on satellite imagery, approximately 3 miles of new roads and 221 acres of well pads were constructed on the Mesa between September 2003 and August 2004 (Table 2.8). Approximately 5% of total surface disturbance was associated with road building, while the other 95% was attributed to well pad construction (Table 2.8).

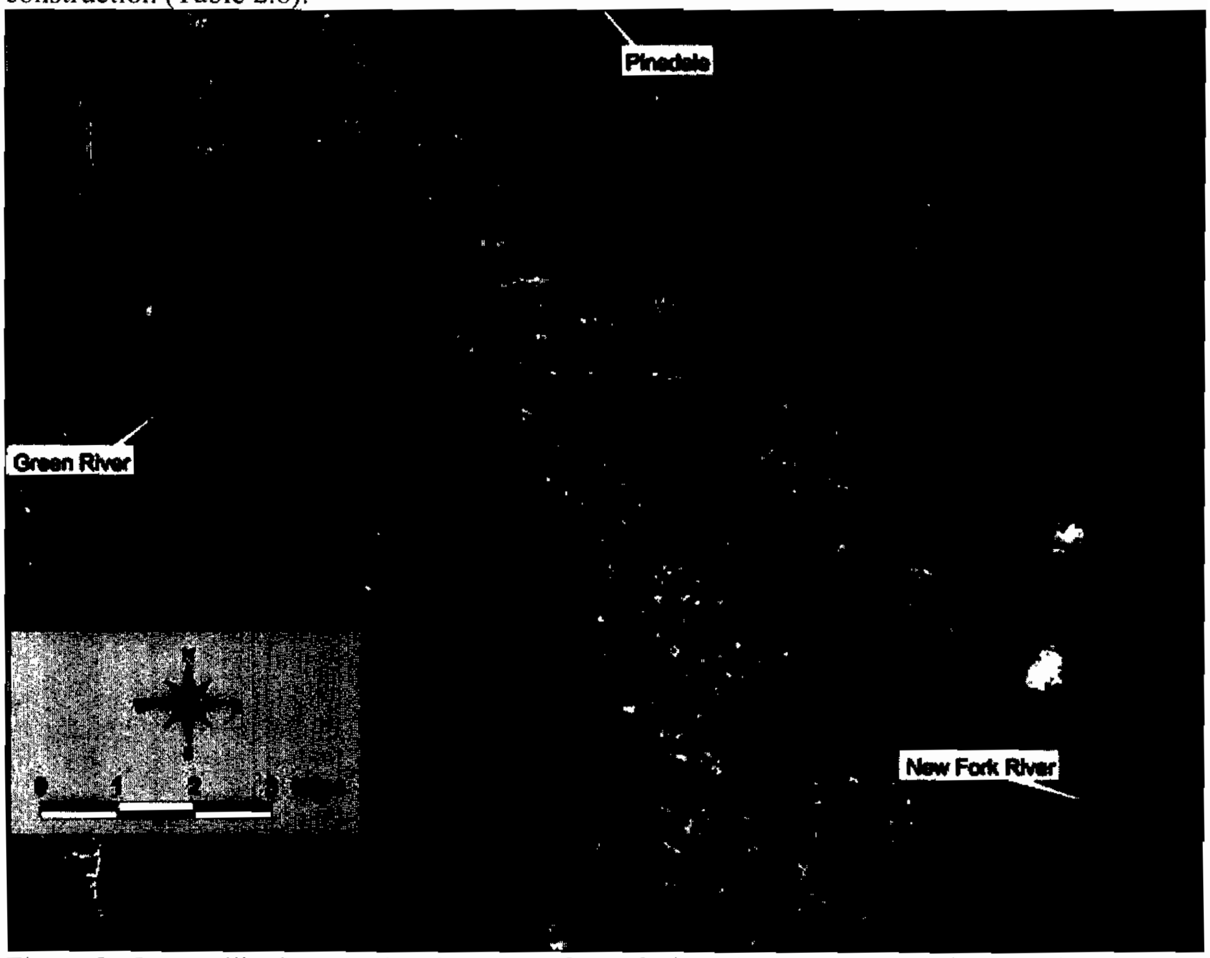

Figure 2.19 Satellite image taken in August 2004 during Year 5 of gas development in the Pinedale Anticline Project Area (PAPA).

Table 2.8 Summary of annual and cumulative direct habitat loss (i.e., surface disturbance) associated with road networks and well pads on the Mesa, 2000-2004.

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2000	11.4	41	39	80	51%	49%
2001	13.1	48	113	161	30%	70%
2002	18.1	66	201	267	25%	75%
2003	13.9	51	237	288	18%	82%
2004	3.2	12	221	233	5%	95%
Total	59.7	218	811	1,029	21%	79%

[a] Based on an average road width of 30 feet.

2.4.6 Resource Selection

Population-level models (Table 2.9) and predictive maps (Figures 2.20-2.24) were estimated for five winter periods: Pre-Development (Winters 1998-99 and 1999-00), Year 1 of Development (Winter 2000-01), Year 2 of Development (Winter 2001-02), Year 3 of Development (Winter 2002-03), and Year 4 of Development (Winter 2003-04).

2.4.6.1 Pre-Development: Winters 1998-99 and 1999-00

The population–level RSPF was estimated from 953 VHF deer locations collected from 45 adult female mule deer during the winters (1 December to 15 April) of 1998–99 and 1999–00 (Table 2.9). Units with the highest probability of use (Figure 2.20) had an average elevation of 2,275 m, an average slope of 5 degrees, and an average road density of 0.14 km/km^2. Aspects with the highest probability of use were northwest and southwest.

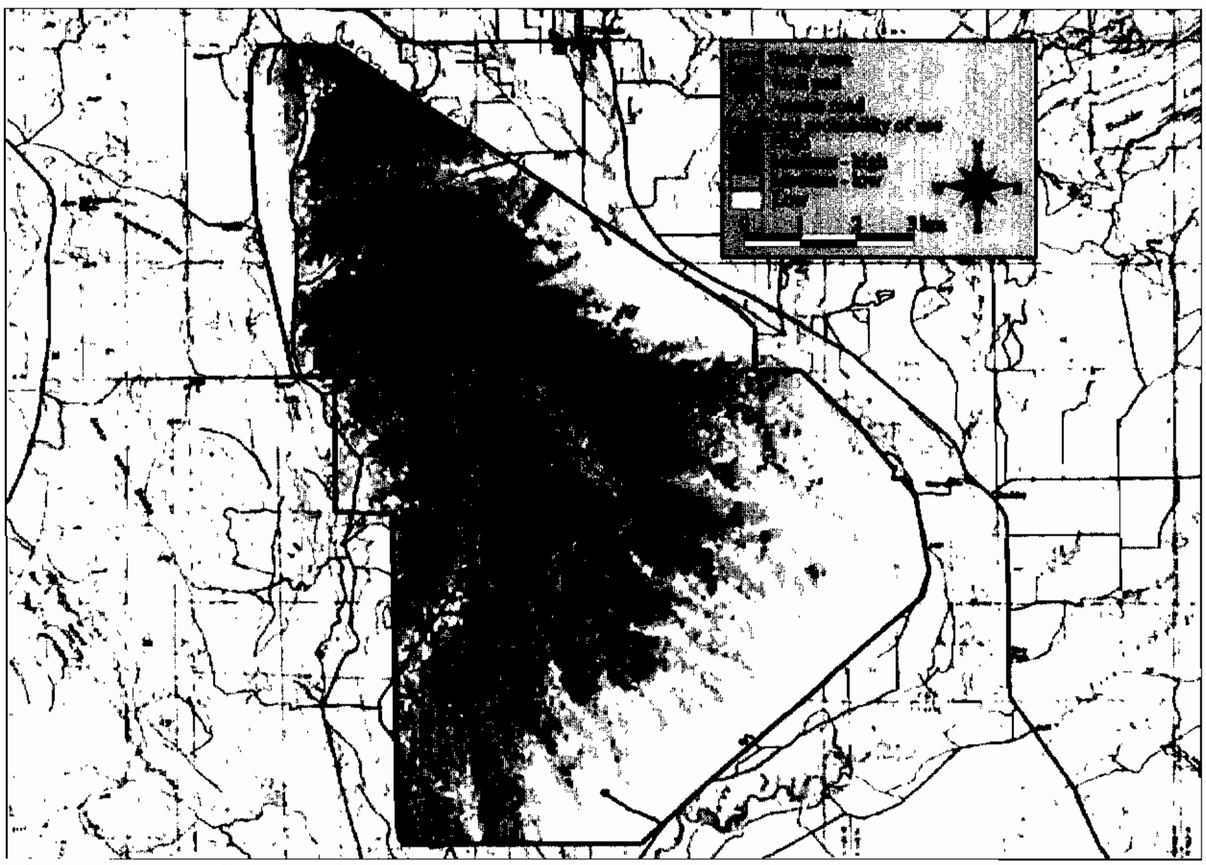

Figure 2.20. Predicted probabilities and associated categories of mule deer habitat use during 1998-99 and 1999-2000 winters, prior to natural gas field development in western Wyoming.